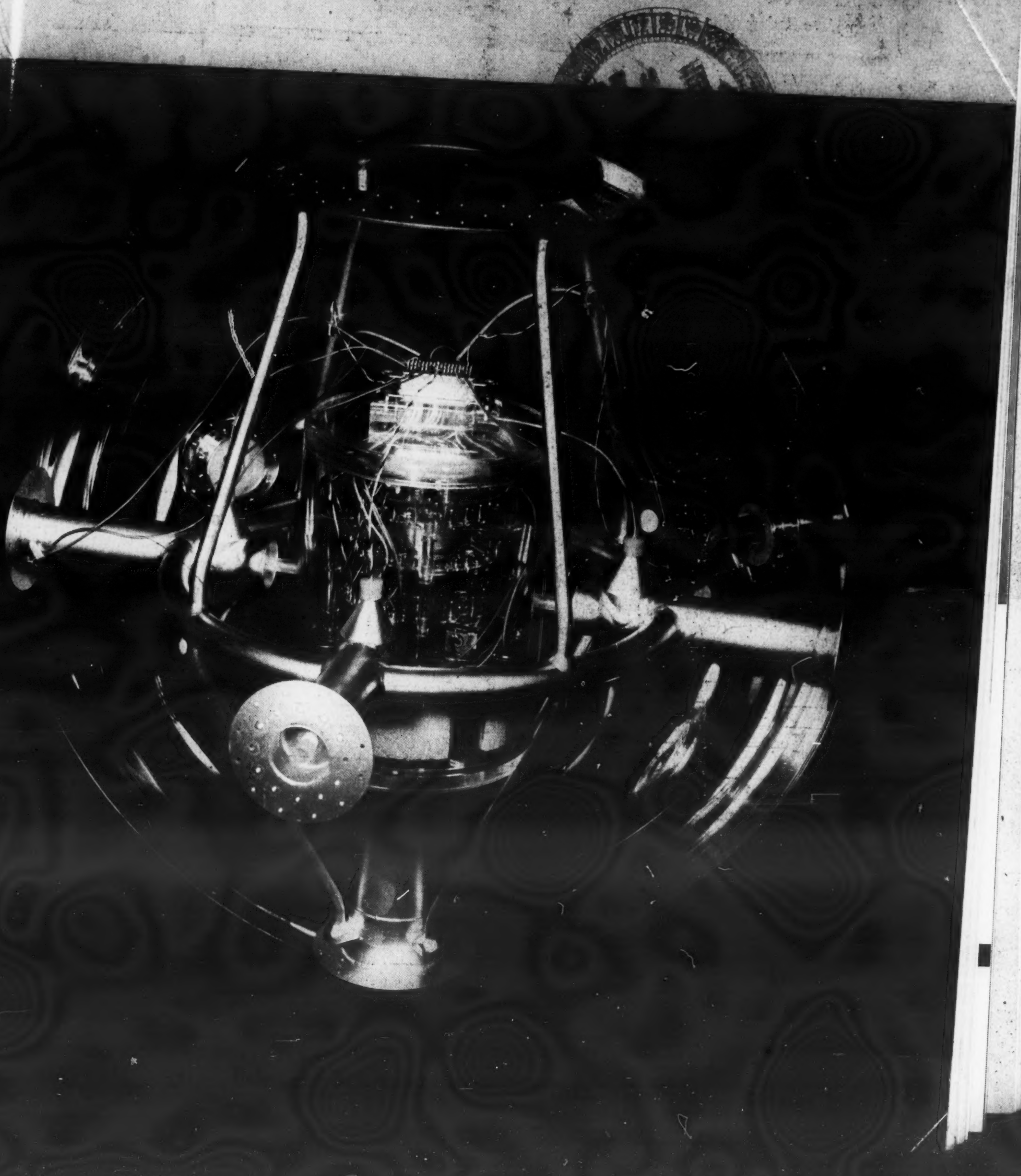
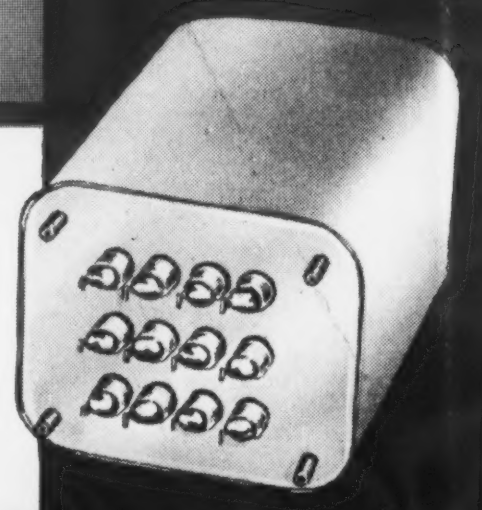
November 1956

Communications—Electronics—Photography

SIGNAL



NEW HERMETIC POWER COMPONENTS



Listed below are just a few of the 50 new **stock items** in the United hermetic power series. These MIL-T-27 power components add to the 200 other hermetic stock items of filter, audio, and magnetic amplifier types. Through the use of proven new materials and design concepts, an unparalleled degree of life and reliability has been attained, considerably exceeding MIL-T-27 requirements. Test proved ratings are provided, not only for military applications but for **industrial, broadcast, and test equipment service (55°C. ambient).**

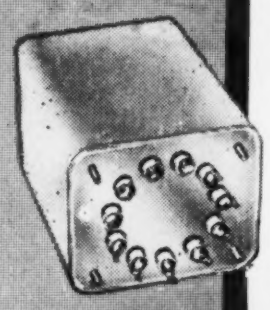
For complete listing of these new items, write for Catalogue #56.

MIL-T-27 RATINGS IN REGULAR TYPE **INDUSTRIAL RATINGS IN BOLD TYPE**

TYPICAL POWER TRANSFORMERS, PRI: 115V., 50-60 cycles.

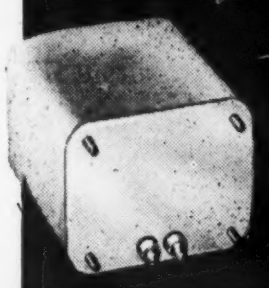
Type No.	HV Sec. C.T.		Approx* DC volts	DC MA	Fil. Wdg.		Approx* DC volts	MA DC	Fil. Wdg.	MIL Case
H-81	500	L	180	65	6.3VCT-3A 5V-2A	L	170	75	6.3VCT-3A 5V-2A	HA
		C	265	55		C	240	65		
	550	L	200	60		L	190	70		
		C	300	50		C	280	60		
H-84	700	L	255	170	6.3V-5A 6.3V-1A 5V-3A	L	240	210	6.3V-6A 6.3V-1.5A 5V-4A	KA
		C	400	110		C	360	150		
	750	L	275	160		L	260	200		
		C	420	105		C	380	140		
H-87	730	L	245	320	6.3V-6A 6.3V-2A 5V-4A	L	210	420	6.3V-6A 6.3V-2A 5V-4A	NB
		C	390	210		C	350	310		
	800	L	275	300		L	245	400		
		C	440	200		C	400	300		
H-93	1000	L	370	280	6.3V-8A 6.3V-4A 5V-6A	L	340	340	6.3V-10A 6.3V-5A 5V-6A	OA
	1200	L	465	250		L	455	300		

*After appropriate H series choke. L ratings are choke input filter, C ratings are condenser input.



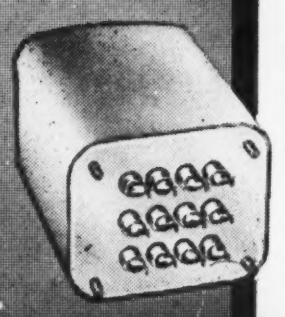
United "H" series power tr
formers are available in types s
to every electronic applica
Proven ratings are listed for
high voltage outputs . . . conde
and choke input filter circuit
military and **industrial** applica

United "H" series filter reactors are extremely flexible in design and rating. Listings show actual inductance at four different values of DC. Bold type listings are **industrial** application maximums.



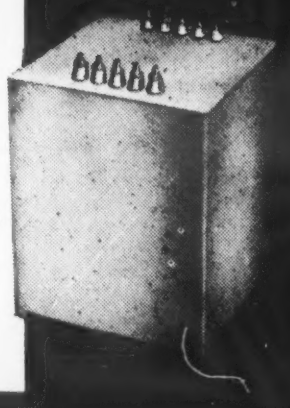
TYPICAL FILAMENT TRANSFORMERS, PRI: 105/115/210/220V., 50-60 cycles.

Type No.	Sec. Volts	Amps. (MIL)	Amps. (Ind)	Test Volts RMS	MIL Case
H-121	2.5	10	12	10000	JB
H-124	5	3	3	2000	FB
H-127	5	20	30	21000	NA
H-131	6.3CT	2	2.5	2500	FB
H-132	6.3CT	6	7	2500	JA
	6.3CT	6	7		
H-136	14, 12, 11CT	10	14	2500	LA



United "H" series filament t
formers have multi-tapped pri
good regulation, and are ra
industrial as well as military s

United "H" series plate transformers incorporate dual high voltage ratings and tapped primaries to provide versatile units for a wide range of military and **industrial** electronic applications. Large units have terminals opposite mounting for typical transmitter use.



UNITED TRANSFORMER CO.

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CABLES: "ARLAB"

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TUNE IN

WORKING TOGETHER TO BRING PEOPLE TOGETHER

★ ★

For many a year, the Bell seal has been the signpost of telephone service. A little while ago we got to thinking that such a well-known symbol deserved a slogan.

We found six words that seem to sum up the story of the telephone and the telephone business . . . "Working Together to Bring People Together."

"Working Together" describes the spirit and co-operation of the telephone companies and the thousands of telephone men and women who help to provide the service.

"To Bring People Together" describes the greatest use of the telephone.

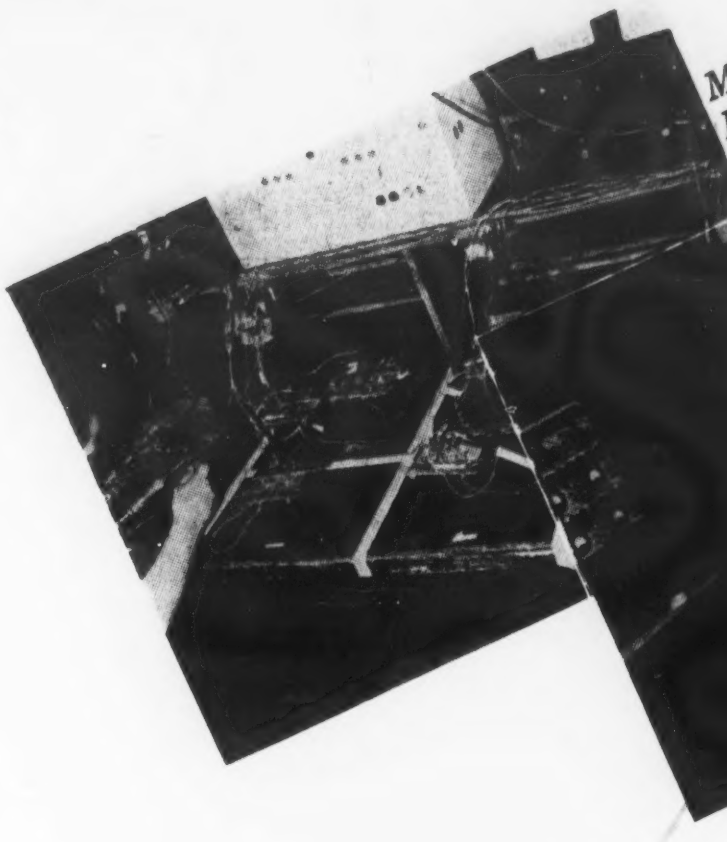
It is priceless in emergencies and indispensable in saving steps and time and getting things done. And one of its biggest values is in helping people keep in touch with each other.

Many a day is brightened just because someone reached for the telephone to exchange news and good wishes and a friendly greeting.

Isn't there someone you'd like to call right now?

BELL TELEPHONE SYSTEM

TUNE IN "TELEPHONE TIME"...The TV program with John Nesbitt's real life stories the whole family can enjoy together...Every Sunday over CBS...See your local newspaper for time and channel.

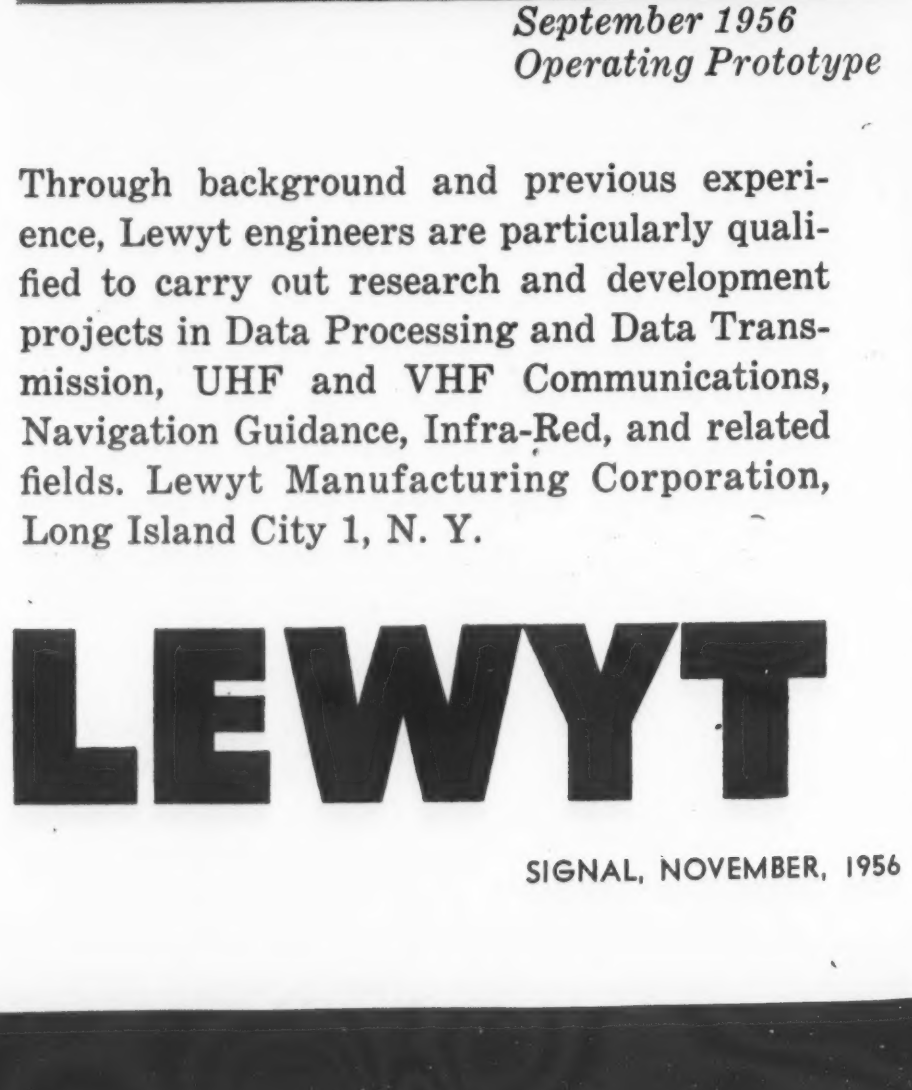


March 1956
Breadboarding of Circuitry

May 1956
Testing Completed Breadboard

July 1956
Engineering Model

IDEA TO PROTOTYPE ...in just 7 months!



September 1956
Operating Prototype

Lewyt cuts delivery time for complex electronic equipment

In developing complex electronic systems for the military, TIME is often the most critical factor. The gap between idea and volume production must be constantly narrowed.

At Lewyt, experienced engineers are at work cutting months from "time in development." Involved equipment, such as Lewyt's Coordinate Data Monitor, urgently needed in the SAGE System, progressed from design stage . . . to breadboard . . . to engineering model . . . to operating prototype, IN RECORD TIME!

Through background and previous experience, Lewyt engineers are particularly qualified to carry out research and development projects in Data Processing and Data Transmission, UHF and VHF Communications, Navigation Guidance, Infra-Red, and related fields. Lewyt Manufacturing Corporation, Long Island City 1, N. Y.

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BPA

SIGNAL

Communications-Electronics-Photography

Journal of the Armed Forces Communications and Electronics Association

VOLUME XI NOVEMBER 1956 NUMBER 3

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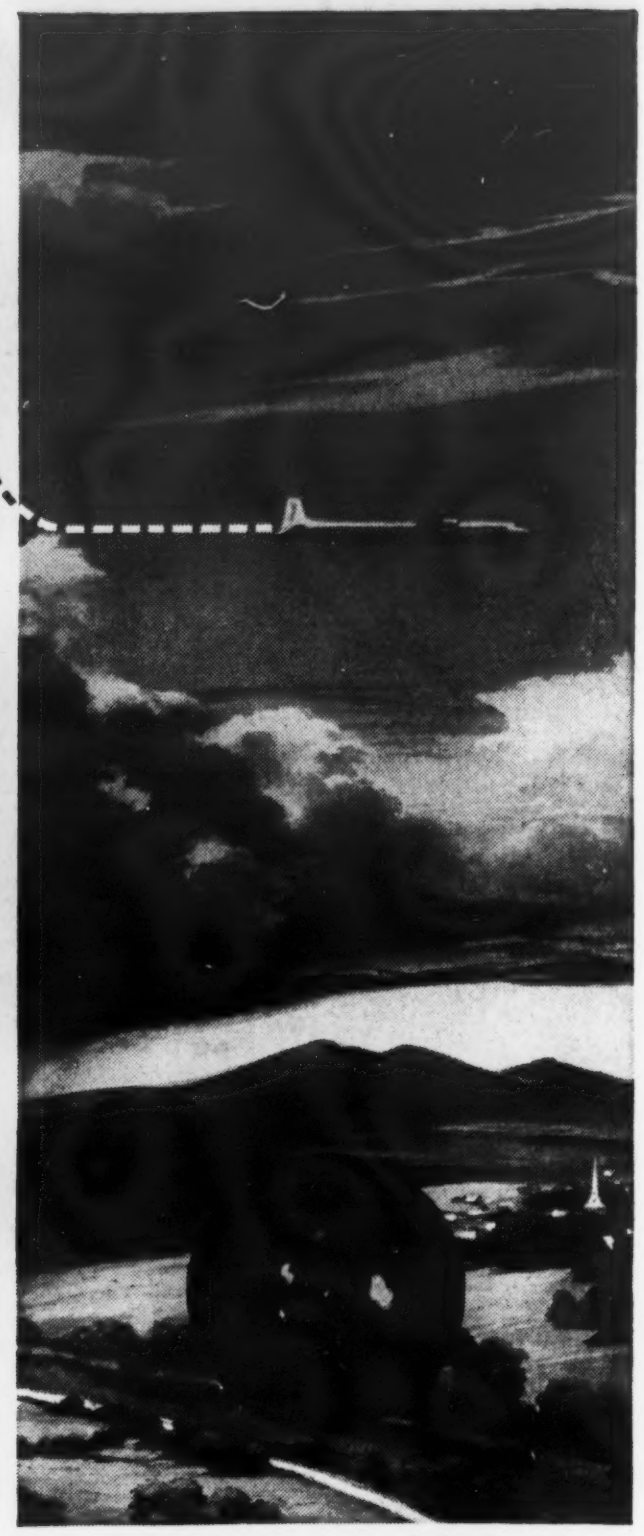
Authors are entirely responsible for opinions expressed in articles appearing in AFCEA publications, and these opinions are not to be construed as official or reflecting the views of the Armed Forces Communications and Electronics Association.

RCA Weather Radar screen shows approach of storm.

Screen guides pilot around turbulent area.



All's well as plane leaves storm behind.

How RCA Weather Radar adds comfort and speed to your flight

No longer need you, as a traveler of the sky, experience the discomfort of bouncing around during storms. If your plane is equipped with RCA Weather Radar, you enjoy comfort and speed throughout—because the plane can by-pass turbulent elements.

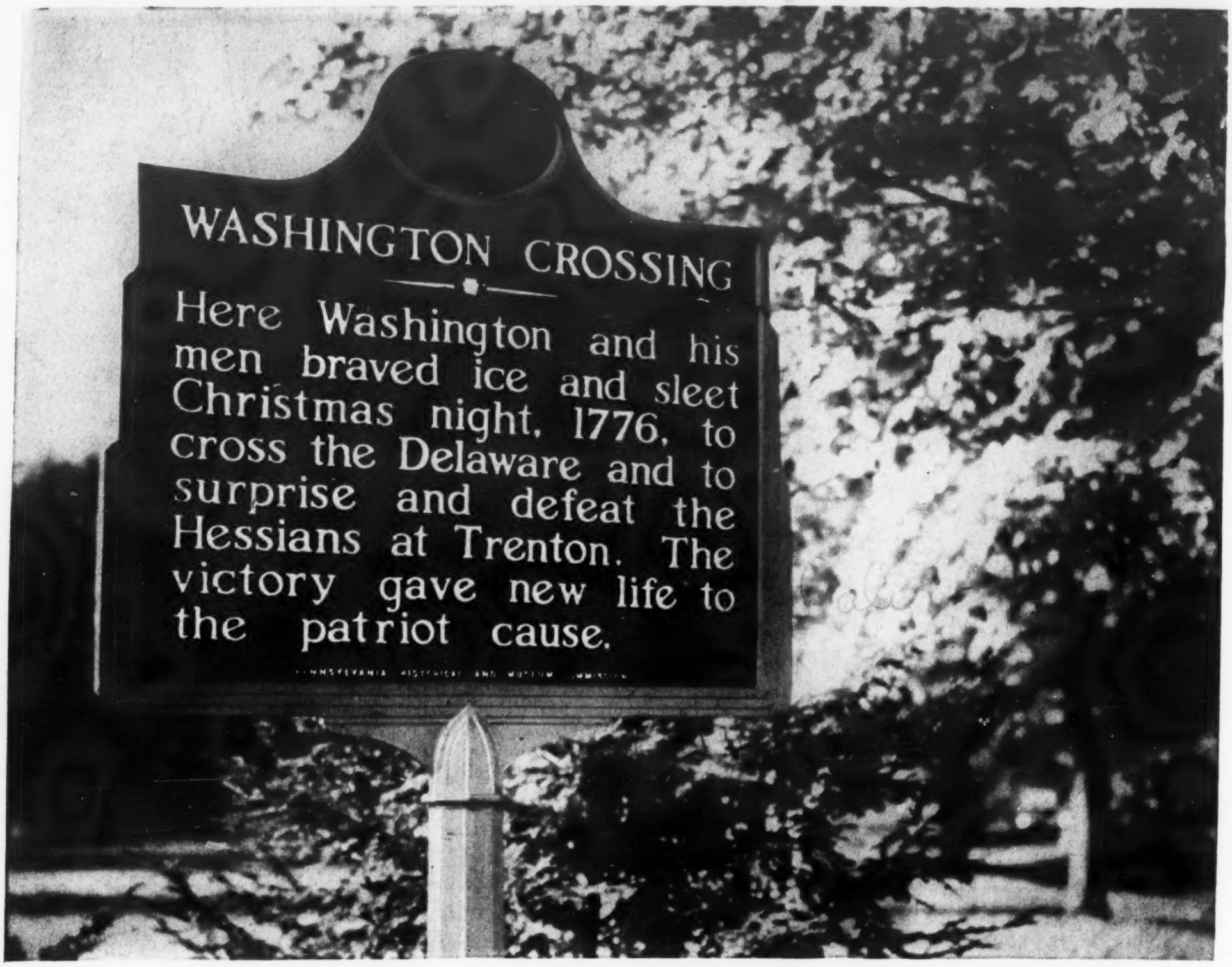
Supersensitive RCA radar peers miles ahead of the plane to give your pilot advance warning of weather disturbances. Signals on its screen then point the way to a smooth course around storm areas saving precious minutes and miles.

The electronic leadership behind Weather Radar is inherent in all RCA products and services. And at the David Sarnoff Research Center of RCA, Princeton, N. J., scientists continue to explore new "Electronics for Living"—electronics that make life easier, safer, happier.

LEADING AIR LINES installing RCA Weather Radar include American Airlines, Continental Air Lines, Pan American World Airways, Trans World Airlines Inc., United Air Lines; and these European Air Lines: Air France, BOAC, Iberia Air Lines of Spain, Sabena Belgian World Airlines, Swissair; Mexicana.

RADIO CORPORATION OF AMERICA

ELECTRONICS FOR LIVING


WASHINGTON CROSSING
Here Washington and his men braved ice and sleet Christmas night, 1776, to cross the Delaware and to surprise and defeat the Hessians at Trenton. The victory gave new life to the patriot cause.

Signpost to a nation's greatness

Freedom's cause never ebbed among the courageous patriots of Washington's army. Today, this sign post stands as mute testimony to an unflinching courage, a dedication to an ideal more precious than life itself. "Peace at any price" they scorned as unworthy the heritage of free men. Craven weakness in the face of oppression they looked upon with contempt. Abandonment of principle was unthinkable! They started America upon the path of greatness. It is our duty in this era of Communist conspiracy to hold fast to these traditions of honor and nobility they have willed us.

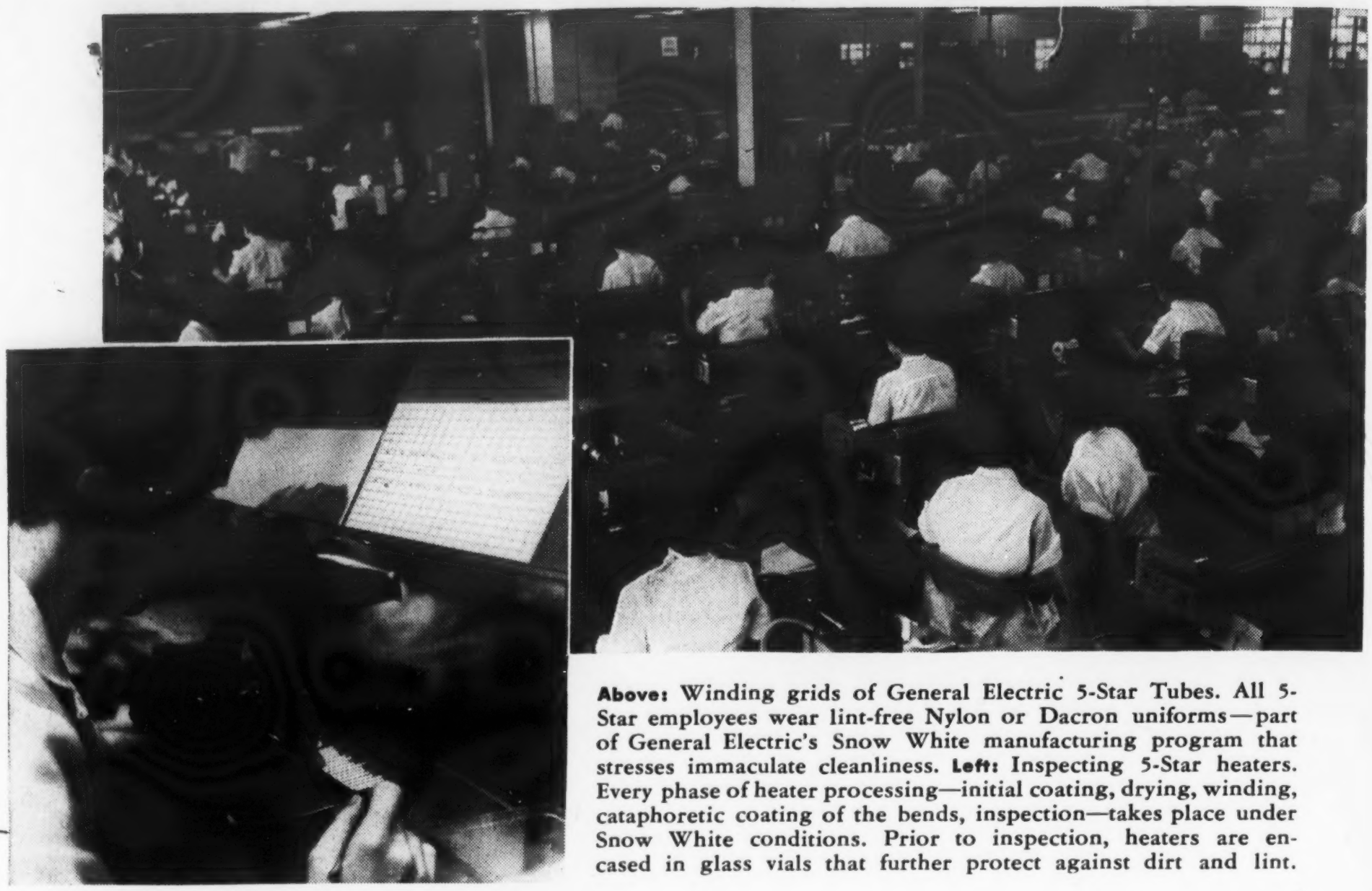
PRESIDENT

DUTY HONOR COUNTRY
LABOR BUSINESS GOVERNMENT

The **GRAY** Manufacturing Company, Hartford 1, Conn.

Audograph, PhonAudograph and Telephone Dictation Systems

and Gray Research & Development Co., Inc., Specialists in Video, Audio and Electro-mechanical Devices



Above: Winding grids of General Electric 5-Star Tubes. All 5-Star employees wear lint-free Nylon or Dacron uniforms—part of General Electric's Snow White manufacturing program that stresses immaculate cleanliness. **Left:** Inspecting 5-Star heaters. Every phase of heater processing—initial coating, drying, winding, cataphoretic coating of the bends, inspection—takes place under Snow White conditions. Prior to inspection, heaters are encased in glass vials that further protect against dirt and lint.

"Snow White" parts manufacture adds to reliability of General Electric 5-Star Tubes!

Production of General Electric high-reliability 5-Star Tubes—subminiatures and miniatures—is *completely* Snow White. Processing of all parts—heaters, cathodes, grids, plates, mica spacers, etc.—takes place in the hospital-clean surroundings of G.E.'s 5-Star factory, where the tubes also are assembled and thoroughly inspected.

Even the tiniest particle of dirt or lint can cause intermittent short circuits and impair a tube's operation. So at every stage of 5-Star production, General Electric employs meticulous care in excluding these sources of tube contamination.

From design through Snow White manufacture and testing, General Electric 5-Star Tubes are built for dependability in critical service. Strengthened construction makes 5-Star Tubes shock-resistant . . . precision manufacture by specially trained workers safeguards electrical performance . . . rigid tests that duplicate field conditions mean every 5-Star Tube is ready to do its job when installed.

In new military electronic equipment, specify G-E 5-Star high-reliability tubes! Use them for replacements! *General Electric Company, Electronic Components Division, Schenectady, 5, N. Y.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

164-1A6

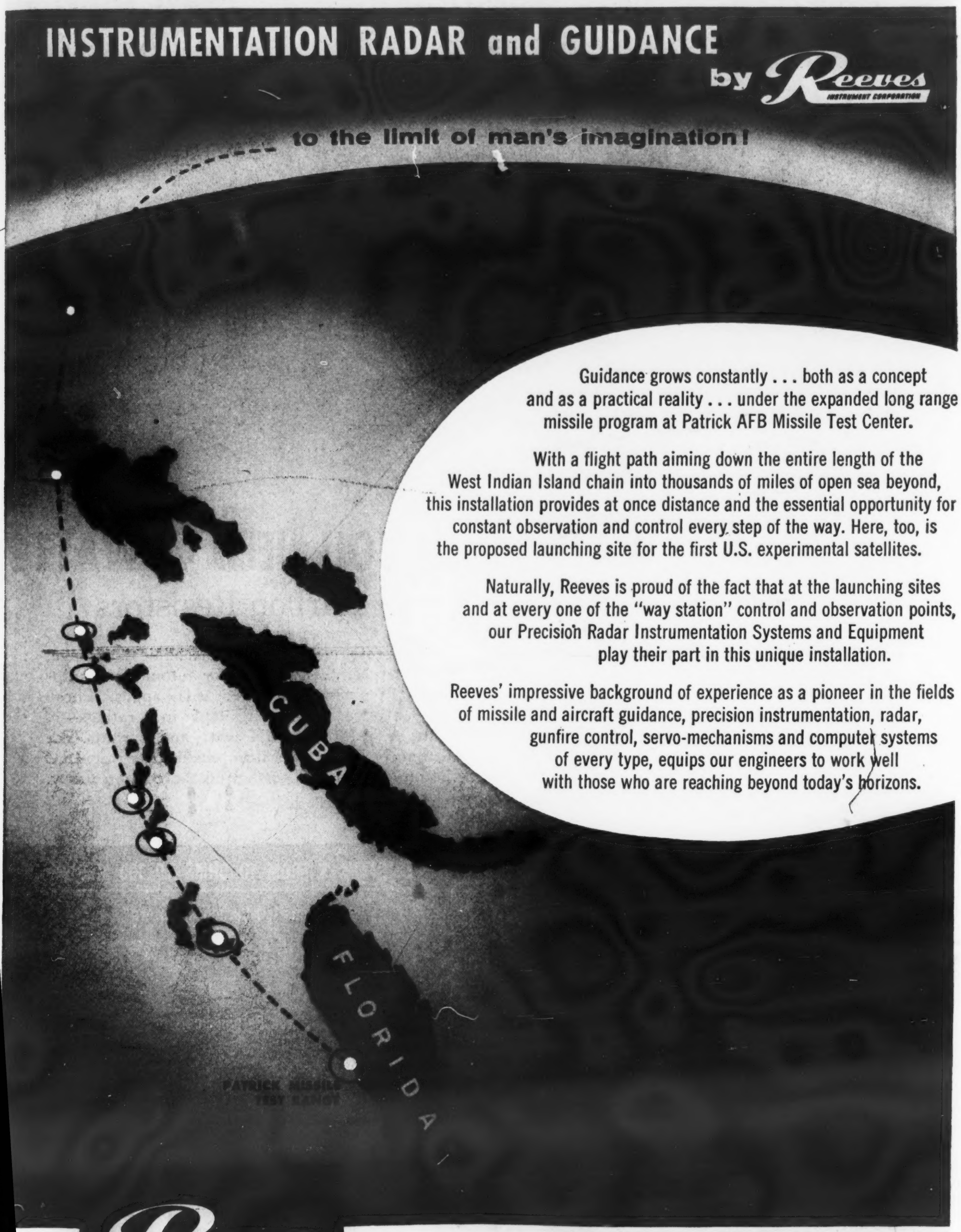
6RV56AR

at PATRICK AFB Missile Test Range . . .

INSTRUMENTATION RADAR and GUIDANCE

by Reeves INSTRUMENT CORPORATION

to the limit of man's imagination!



Guidance grows constantly . . . both as a concept and as a practical reality . . . under the expanded long range missile program at Patrick AFB Missile Test Center.

With a flight path aiming down the entire length of the West Indian Island chain into thousands of miles of open sea beyond, this installation provides at once distance and the essential opportunity for constant observation and control every step of the way. Here, too, is the proposed launching site for the first U.S. experimental satellites.

Naturally, Reeves is proud of the fact that at the launching sites and at every one of the "way station" control and observation points, our Precision Radar Instrumentation Systems and Equipment play their part in this unique installation.

Reeves' impressive background of experience as a pioneer in the fields of missile and aircraft guidance, precision instrumentation, radar, gunfire control, servo-mechanisms and computer systems of every type, equips our engineers to work well with those who are reaching beyond today's horizons.

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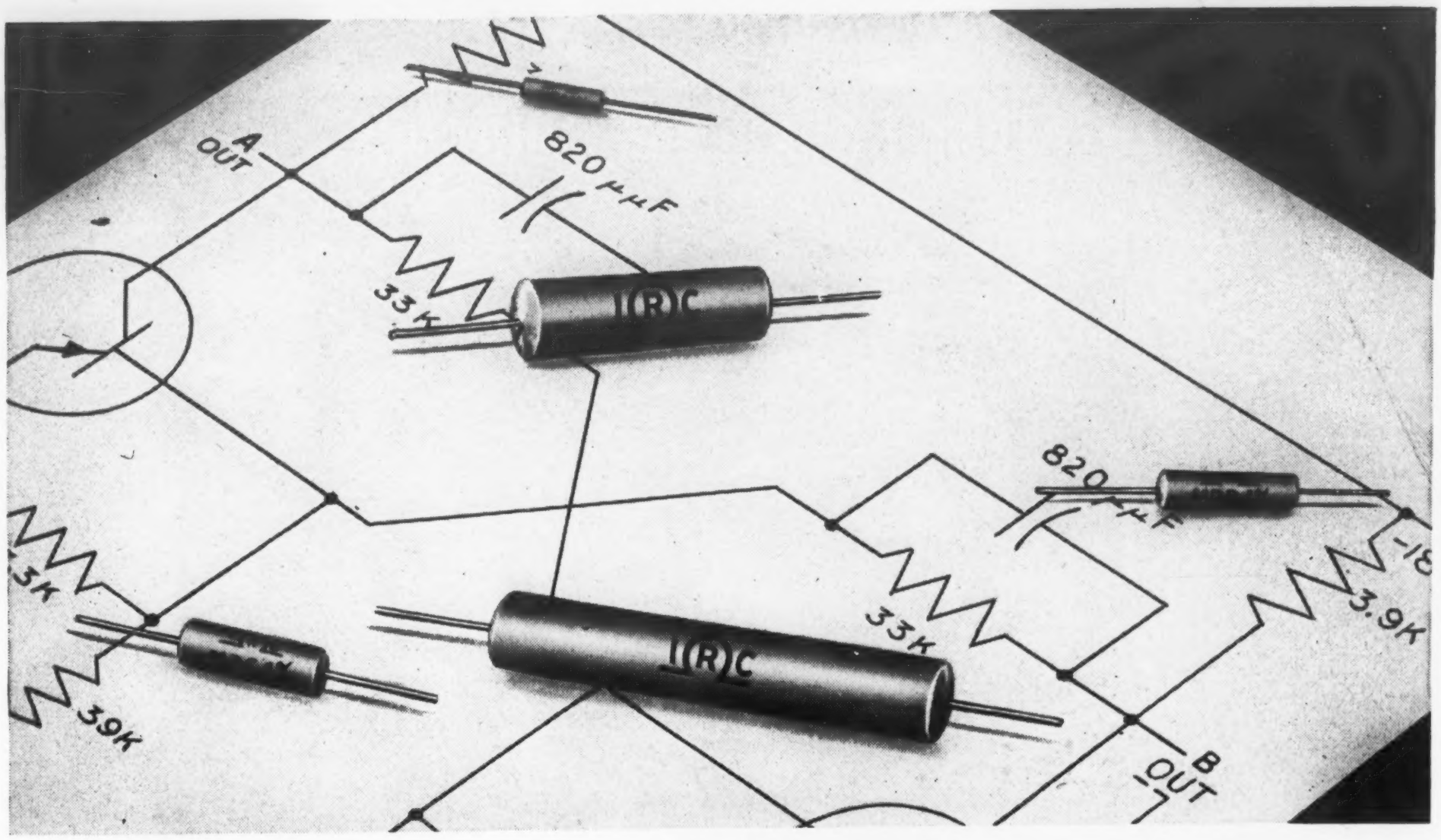

WHY SPECIFY 1 WATT WHEN YOU NEED ½ WATT?

Use **IRC®** Deposited and Boron Carbon Resistors

Now you can save two ways whenever circuits call for high precision resistors with long term stability and built-in overload protection. IRC Molded Deposited and Boron Carbon Resistors can withstand substantial overloads for considerable periods without exceeding tolerances. This means savings in *space*, *weight* and *cost!* The conservative rating of these units assures you of reliability—no need to specify larger resistors.

Announcing a new high-range process featuring stability! With a unit as small as IRC's ½ watt Deposited Carbon Resistor, you can cover a resistance range from 10 ohms up to *25 megohms*. With IRC's 2 watt resistor, you can go from 15 ohms as high as *100 megohms*.

If you want the same span of resistance ranges, plus better load life characteristics and greater resistance to moisture and mechanical damage, you can specify *molded* types for automation equipment in sizes that meet MIL specs. These molded units are now available in 5 ratings—⅛ watt, ¼ watt, ½ watt, 1 watt, and 2 watts. For extremely low temperature coefficients, use IRC Boron Carbon Resistors. Send the coupon today.

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Send bulletins describing ☐ Deposited Carbons ☐ Molded Deposited Carbons ☐ Boron Carbons ☐ Molded Boron Carbons.

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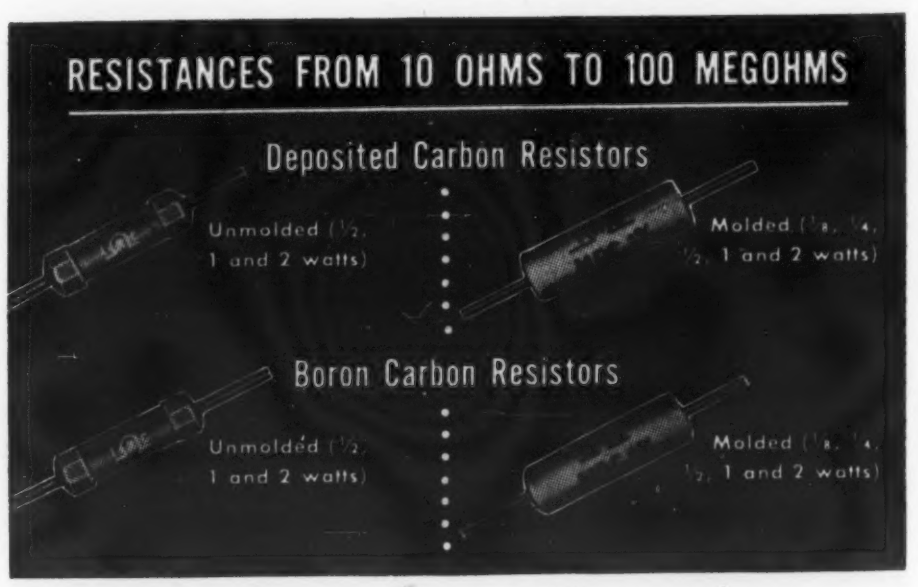
RESISTANCES FROM 10 OHMS TO 100 MEGOHMS
Deposited Carbon Resistors
Unmolded (½, 1 and 2 watts)
Molded (⅛, ¼, ½, 1 and 2 watts)
Boron Carbon Resistors
Unmolded (½, 1 and 2 watts)
Molded (⅛, ¼, ½, 1 and 2 watts)

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Wherever the Circuit Says

Low Wattage Wire Wounds • Resistance Strips and Discs • Selenium Rectifiers and Diodes • Hermetic SealingTerminals • InsulatedChokes • Precision Wire Wounds.

IRC

Pictured above: Personnel of P. R. Mallory & Co., Inc., participate in a company fire-fighting demonstration. All those who attended the demonstration had an opportunity to use the carbon dioxide-type extinguishing equipment to put out a trash fire. Demonstrations such as this one are a regular part of the company's disaster program.

planning against wartime catastrophes

by R. F. Sparrow
Vice President, P. R. Mallory & Co., Inc.

THE NEED FOR SOUND, PRACTICAL disaster planning by America's industrial corporations cannot be overemphasized or repeated too often. The timing of a future emergency, of course, is indefinite, and even the kinds of catastrophes which an emergency may bring cannot be spelled out precisely. Therefore, disaster planning is a type of problem that is somewhat different from but certainly no less difficult than the situations with which the businessman must cope regularly.

Industrial disaster planning is different because the related problems, which could be so strikingly tangible tomorrow, are intangible today. This type of planning is difficult because the range of timing is so broad, varying from the next tick of the clock to some unknown instant in the future—a week, a month, a year, or even decades away. Furthermore, it is difficult because American soil has previously been spared the ravages of attack by an enemy using modern fighting methods. This very fortunate historical fact, however, means that we lack the advantages of this best teacher and convincer of all, namely, actual experience.

Planning for Disaster

Because of these differences and difficulties, corporate management must exercise an exceptionally high degree of imagination and self-discipline in its moves to gear for a possible disaster. Management has a major job in selling its people on getting ready and staying ready for something which may never occur. Americans by and large are optimistic, which adds to the difficulties of any problem involving preventive measures. Another problem which management must face is that of keeping its disaster plan up to date once it is out of the "thinking and talking over" stage. New methods and techniques of coping with emergencies are being developed at a rapid rate. Thus, management can ill afford to allow any freezing of its original plan. The plan must be flexible in concept, adaptable to change, but still ready for implementation upon an instant's notice. And, above all, the plan must be continually sold and resold, not only to new employees, but to the older employees as well.

Although there are many parallel threads woven throughout any disaster plan, regardless of the types of

products which a company may make, there are also some elements which loom more important to a supplier of one type of products than to another. Therefore, a manufacturer must first consider most seriously his role in peacetime and during mobilization. This must include a study of his past and present activities as well as the application of perspective to future activities.

Role in Defense Important

We at Mallory have taken our role as a supplier of critical electronic, electro-mechanical, and electro-chemical and metallurgical products and components most seriously. We fully realize that any emergency at a Mallory plant would result in a critical shortage of needed components going into such end products as communications equipment, radar, aircraft, guided missiles, rockets, transportation equipment, electrical generating and atomic power plants. For example, since we are one of the largest suppliers of a broad range of electronic components, the damage to a Mallory factory would affect not a few, but hundreds of producers of end products urgently needed during mobilization. Once the corporation's specific role was clearly defined, this could be used to shape its disaster plans for maximum effectiveness.

Basic Ingredients of Plan

Early in our planning we recognized several basic ingredients which must be considered in developing and maintaining an effective disaster program. Some of these factors included: (1) means for spreading the risk; (2) acquiring special skills and know-how; (3) obtaining special equipment and materials for emergency use; (4) training our people in the proper and expeditious execution of disaster procedures; (5) building an effective, rapid, and extensive communications network, not only between our various offices, departments, and plant locations, but also between our communications centers and those on the outside, such as Civil Defense communications headquarters; (6) seeking ways and means to reduce manpower needs in time of emergency; and (7) developing and selling coordination and cooperation among our people.

Pictured above is the Mallory Security Committee: Standing left to right: Arthur Ruppert, engineering services; John S. Ashby, Jr., manager, government sales; Wayne Etter, manager, operations, contact division. Seated: Frank L. Zirkle, security director; Larmon G. Dawson, manager, plant services; Jack Michels, director of personnel.

At one time our manufacturing operations largely centered in the Indianapolis area. For reasons of dispersion and to obtain economical sources of power, water, and other utilities so essential in the electro-chemical phases of our business, we sought locations in other parts of the United States for the building of new plants. In our plant location studies, the matter of whether or not a particular area was a good wartime disaster risk was always taken into very serious consideration and was a major factor in determining our final decision.

Decentralization

As a consequence, we now have factories located away from large cities and prime bombing targets. For example, our mercury battery production is now centered in North Tarrytown, N. Y., which is outside the prime New York City target area. Our resistors and controls are made in Frankfort, Indiana, which is out of the Indianapolis target area. Our timer switches are made in Warsaw, N. Y., which is beyond the immediate Buffalo-Niagara Falls target area. Our new capacitor plant is located in Huntsville, Ala., which is off the beaten track, so to speak, and selected for reasons which probably paralleled the Military's reasons for locating Redstone Arsenal. Our titanium production is centered in Niles, Ohio, which is away from the prime Pittsburgh and Youngstown target areas.

Location of Competitors' Plants Considered

This matter of plant location, especially as regards expansion, is one of the first and most important items in the development of any disaster program. No type of protective construction for any given plant can equal the effective reduction of risk through dispersion of manufacturing facilities. In a critical industry such as ours, the manufacturer must also consider the locations of his competitors' plants. Mallory plants are not located in the same area as competing plants making the same types of products. This is extremely important to the Nation as insurance against an enemy concentrating on knocking out one particular type of production. When planning new plants in carefully selected locations, we also build them so that additional facilities can be constructed at minimum expense and in minimum time. Our Huntsville, Ala., plant, for ex-

IT&T has been selected

FOR 2 IMPORTANT TOP-OF-THE-WORLD COMMUNICATIONS PROJECTS

. . . to recruit and train the technical manpower for, and to maintain and operate

★ the DEW LINE

★ WHITE ALICE

Two of the greatest Arctic construction jobs ever attempted are drawing to a dramatic climax.

One, the Distant Early Warning (DEW) Line, will flash the *first* warning of an enemy approaching from the north. It is America's latest answer to the challenge of maintaining world peace.

The other, Alaska Integrated Communications Exchange (White Alice), is a vital network including "over-the-horizon" and "line-of-sight" microwave links connecting isolated communities and defense installations across Alaska, as well as existing telephone and telegraph services.

Manpower of the highest order in skills, stamina and intelligence is imperative. The U. S. Air Force has selected Federal Electric Corporation, a subsidiary of International Telephone and Telegraph Corporation, to operate and maintain both these far-flung installations.

Federal Electric Corporation's experience on military assignments in the Arctic . . . in the maintenance of specialized navigational equipment for the Air Force . . . as a field service and maintenance organization for IT&T's laboratories and factories . . . coupled with the world-wide experience of IT&T, make this an ideal partnership for so broad and technical an undertaking.

IT&T

INTERNATIONAL TEL AND TEL

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION, 67 Broad Street, New York 4, N. Y.

ample, incorporates several wall areas which can be easily knocked out for the expansion of a presently roofed section.

Often, the concept of geographical decentralization is considered only in terms of producing plants, with all research still centered in the home office location. Large research and development centers also make excellent targets for bombing. Not only is a corporation's technical brain center at stake, but also the complex and often specially developed research tools which would require months to replace. At Mallory, we have extended our decentralization policy to include research and development facilities. Such activities are currently carried on at six widely dispersed locations through the entire United States.

Dispersal of our operations from large city target areas also has been taken into consideration in connection with our district sales offices, which, during an emergency, would overnight become field engineering centers. To improve field engineering efficiency, we have instituted a plan whereby our twenty-odd district offices in the United States and Canada ultimately will be moved from crowded city centers, with their accompanying difficult transportation problems, to nearby small towns and suburbs. In time of emergency, our field engineering staffs would be strengthened by assignment of additional engineers from our plants. In that way, our ability to render exceptionally fast and thorough field engineering service would be greatly accentuated and would minimize the need for our engineers to travel to and fro across the Nation on crowded wartime transportation facilities.

Human Aspects of Security

During the last several years, we at P. R. Mallory & Co., Inc., have worked closely with the Business and Defense Services Administration of the U. S. Department of Commerce, the Military, and other Government agencies. In our disaster planning, we have found it exceedingly helpful to secure the counsel of such organizations, not only because of their past wartime experience, but also because of the "know-how" they have developed in working with other companies which are also trying to do the best possible job of disaster planning.

As a part of our disaster plan, we have added a security director who has had 21 years of investigatory and police experience. Our security director deals not only with the physical aspects of protecting our restricted projects, including equipment, drawings, specifications, and so on, but also with the human aspects of security. Our security office maintains complete records on all present employees, and all new people are very carefully checked as regards loyalty in an effort to minimize the possibilities of sabotage. At least 200 key people have been thoroughly checked as the result of working closely with the civilian Government and military security offices so that upon a moment's notice supervisors and executives currently engaged in consumer and other non-defense programs could be swung over into the administration of classified programs.

The old concept of the plant guard has been replaced with the concept of the Security Office, as typified by the insignia which they now display. All of these officers have had thorough anti-riot and anti-mass hysteria training and take refresher training along these lines at frequent intervals. They have been trained to do a preventive job and are fully capable of handling such situations should they arise. When new security officers are hired, an effort is made to secure men who have had previous police training and experience.

Because we believe that security

(*Continued on page 64*)

Shown above is a demonstration of a safe transferral of an injured man to a stretcher as performed by Mallory guards taking the safety course. Guards are trained not only in first aid, but also in handling riots and mass hysteria. Besides having the initial training, they must also take refresher courses from time to time.

Shown at the right is a demonstration of the correct way to carry a victim downstairs on a stretcher. This demonstration is part of a first-aid course for guards and foremen given at P. R. Mallory & Co.

From the President

Dear Member:

At the commencement of the season of chapter activities, I know that your attention is naturally focused on your own local problems. I believe, however, that you may be interested to learn what is going on at National Headquarters.

Since the Convention last May, there have been a number of significant changes in the National Headquarters. These changes not only involved personnel, but reflect major changes in the administrative policy.

To carry on the business administration of the Association, we were fortunate to obtain the services of Colonel Olmsted, a retired officer of thirty years' service, who has enjoyed a broad business background and familiarity with the Armed Forces-industry problem. A graduate of the Military Academy class of 1917, Colonel Olmsted, in addition to having taken a course at M. I. T., holds a degree from the Harvard School of Business Administration. During the war, he directed the Requirements Division of the Army Ordnance Department, where he first came in contact with the newly born electronics industry.

Another important change was the appointment of Colonel "Sparky" Baird as editor of SIGNAL, a position formerly held by the executive vice president. Sparky Baird brings to SIGNAL not only experience in editorial work, but a natural aptitude for this task. He, too, has enjoyed a wide acquaintance with industry, gained as Assistant Commandant of the Industrial College of the Armed Forces.

Another significant change which has taken place relates to the NEWS LETTER. Formerly published as a separate publication, it now has been combined with SIGNAL. The reasons behind this change are largely financial. Whereas it used to cost around five thousand dollars a year to publish the monthly NEWS LETTER, as a News Letter Edition of SIGNAL, it now pays its way.

More important still, however, is the drive underway to improve the editorial content of both SIGNAL and the NEWS LETTER. The anniversary issue is a good example of the progress being made. We know that SIGNAL is now outstanding in its field, but we aim for continuous improvement so that it will be an invaluable asset to anyone interested in the field of communications, electronics, and photography.

There has been some criticism of SIGNAL on the grounds that it is written too much on the popular level and not on the scientific level. Such criticism has some justification, but when the divergent interests of our subscribers are concerned, it should be apparent that a purely technical article on one subject, while of interest to a small segment of our readers, might leave a majority cold. SIGNAL could not and should not compete with the purely technical journals. This does not exclude, however, publication from time to time of technical papers of value and interest. In fact, SIGNAL will welcome technical articles to be published from time to time.

We hope that to the Naval officer on sea duty who is interested in communications or electronics, to the Signal Corps officer overseas or to the Air Force officer on some remote base, to the foreign chapters and to individual members and industry here in the United States, SIGNAL will prove an invaluable contact of continuing professional interest.

Finally, I would like to say that National Headquarters is fully aware of the problems facing the chapters. It can help in getting speakers. It can furnish motion pictures and other material for meetings, and it can alwa·s lend a sympathetic ear to chapters with difficult problems.

Sincerely,

Percy G. Black

National President

STEWART SW WARNER ELECTRONICS

a Division of Stewart-Warner Corporation
1300 No. Kostner Ave., Chicago 51, Ill.

WARM WELCOME

Stewart-Warner Electronics today detects the presence of high-performance aircraft, identifies it as friend or foe and can provide a warm missile welcome in an instant.

Research and development at Stewart-Warner Electronics have produced these advanced systems. The program is still expanding, as are the opportunities for the exceptionally well-qualified engineer.

Today as yesterday, Stewart-Warner Electronics safeguards our skies with tomorrow's planning and production.

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PUERTO RICO

electronics supplier

by RAdm. Thomas F. Halloran, U.S.N. (Ret.)

BY VIRTUE OF ITS STRATEGIC LOCATION and close association with the United States, Puerto Rico is the keystone of our Caribbean defense system.

The Commonwealth's contribution to our defense effort is well known to many in the U. S. military. But what may not be as equally well known is that Puerto Rico, which was settled 100 years before the pilgrims landed on Plymouth Rock, is contributing to defense in another way: as a growing manufacturing center of precision-made instruments and electronics equipment used by our Armed Forces.

Electronics growth in Puerto Rico is remarkable from both the sheer physical expansion and the rapidity with which Puerto Ricans have evolved from 19th century farmers into competent 20th century technicians and production workers.

Shown above is a Puerto Rican operator at the Punch Press for mica separators.

Electronics Affiliates Established

U. S. electronics manufacturers first looked into Puerto Rico at the outset of the Korean War. Apparently, they liked what they saw, for since then, 35 electronics affiliates have been established there, including those backed by General Electric, Remington Rand, Sylvania, Weston Electrical Instrument, Hermetic Seal, Proctor Electric, Carborundum, and Thor.

The cathode-ray tubes, crystal ovens, pulse generators, rectifiers, meters, oscilloscopes, and other industrial-consumer products that these affiliates produce are shipped to parent plants in the U. S. mainland by sea and air. Hermetic Seal's branch plant near San Juan, for example, packs 5 million precision-made, sub-component units each month into glass jars and ships them by air freight to its main plant in Newark, New Jersey. The total value of electronics equipment made in Puerto Rico and shipped to the mainland is now about 16½ million a year and probably will increase in 1956 on the heels of current expansion.

Why is there a rapid growth of U. S. branch electronics manufacturing plants on a Caribbean island more than one thousand miles away from major markets? The reasons are important to an industry where competition is keen: tax and labor savings, backed up by a rising productivity of nimble-fingered Puerto Rican electronics workers.

EDA Findings

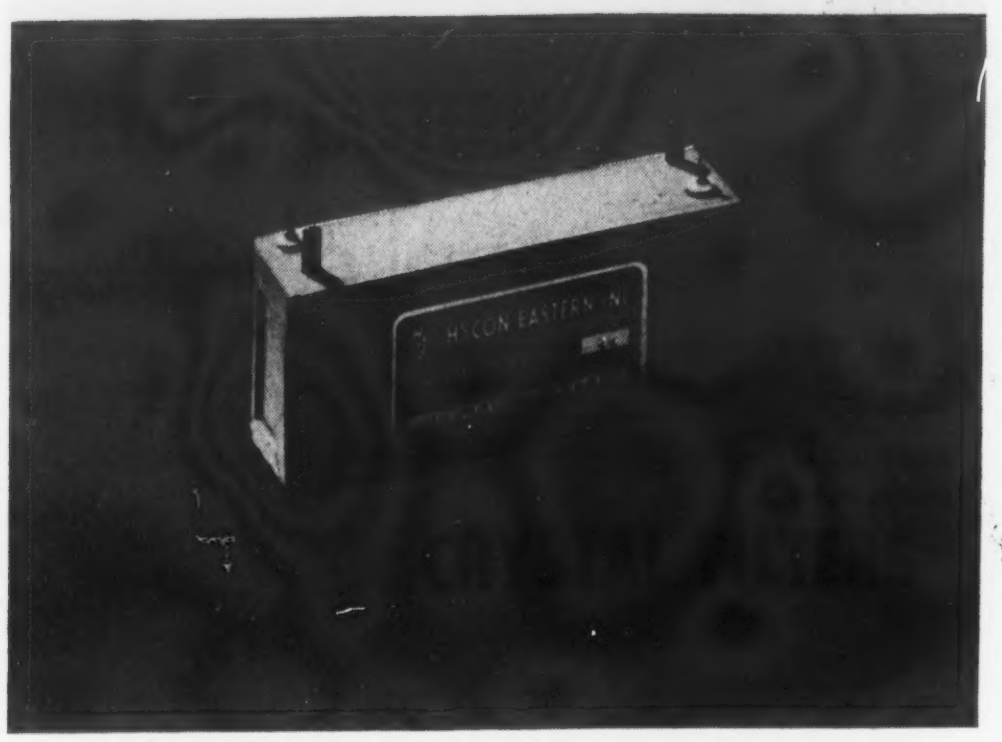
The EDA (Economic Development Administration) in New York City has found that electronics workers in Puerto Rico, on the average, attain productivity rates of 90 per cent of U. S. mainland standards after 10 months of training. One company attained 114 per cent after 13 months.

Says a retired official of Weston Electrical Instrument Corporation, a subsidiary of Daystrom Inc., "Puerto Ricans in our Ponce affiliate are gregarious, willing, and eager to learn;

The Author

RAdm. Thomas F. Halloran (USN, Ret.), was formerly director of industrial development for Puerto Rico's Economic Development Administration in New York City.

Now . . . only 1 Conversion from VHF to Audio



Hycon Eastern is now producing standard Crystal Filters with extremely high selectivity at frequencies which eliminate the need for multiple conversions. Among these are Model 13MA and Model 13MB for use in VHF FM receivers. Model 13MB may be used in AM receivers as well as in the proposed split channel FM systems. Their low insertion loss, linear transfer characteristics and non-microphonic qualities permit their location at any point of low signal level such as between the mixer and the i.f. amplifier. For FM applications Hycon Eastern has available standard Crystal Discriminators centered at 13Mc which may be used in conjunction with Model 13MA or Model 13MB.

- **SMALL SIZE — ONLY 3 5/16" X 1" X 1 1/2"**
- **FREQUENCY SHIFT LESS THAN ±.005% TOTAL FROM −55° C. TO +85° C.**
- **NON-MICROPHONIC**
- **UNAFFECTED BY IMPEDANCE VARIATIONS COMMONLY ENCOUNTERED IN TRANSISTOR CIRCUITS**
- **WORKS DIRECTLY TUBE-TO-TUBE OR TRANSISTOR-TO-TRANSISTOR WITH NO PADDING**
- **HERMETICALLY SEALED, NO ALIGNMENT OR READJUSTMENT NECESSARY**

Write for Crystal Filter Bulletin

HYCON EASTERN, INC.

75 Cambridge Parkway Dept. G-11 Cambridge 42, Mass.
Affiliated with HYCON MFG. COMPANY, Pasadena, California

quick to catch on."

Note that so far I speak only about American electronics companies establishing *branch* plants in this self-governing Commonwealth freely associated with the United States. Puerto Rico does not want "run away" electronics plants which would close down in the mainland only to reopen in Puerto Rico.

To discourage this, EDA bars such "run away" electronics plants from participation in its industrial incentives program which includes exemption from Puerto Rican income taxes for ten years, technical assistance, help in training labor, construction of modern plant buildings, even down to such personal details as making sure that newly arrived mainland executives have phones promptly installed in their island residence.

And don't forget the biggest tax saving! Since Puerto Rico has no vote in Washington, it enjoys complete freedom from federal corporation taxes. The table shows graphically what this means to U. S. electronics manufacturers who expand to Puerto Rico.

Tax Savings

How Corporate Tax Exemption Affects Profits

If your net profit after U.S. Corporate income tax is:	Your net profit in Puerto Rico would be:
$ 29,500	$ 50,000
53,500	100,000
245,000	500,000

EDA economists estimate that electronics affiliates in Puerto Rico show average net profits of 28 per cent of net sales before and *after* taxes. Compare this to comparable operations in the mainland which average 20 per cent net profit *before* taxes. Three major electronics subsidiaries in the island average profits of 30-40 per cent in ratio to net sales.

Why is Puerto Rico offering these incentives along with custom-made surveys which provide a manufacturing cost analysis comparing Puerto Rico with any other site named by the electronics company desiring the survey? Simply because it needs industry badly. About 100,000 Puerto Ricans are still unemployed. twice that number underemployed, all out of a total work force of 650,000.

Looking at it another way, visualize the U. S. mainland with 15 million chronically unemployed, and I think you can sympathize with Puerto Rico's problem.

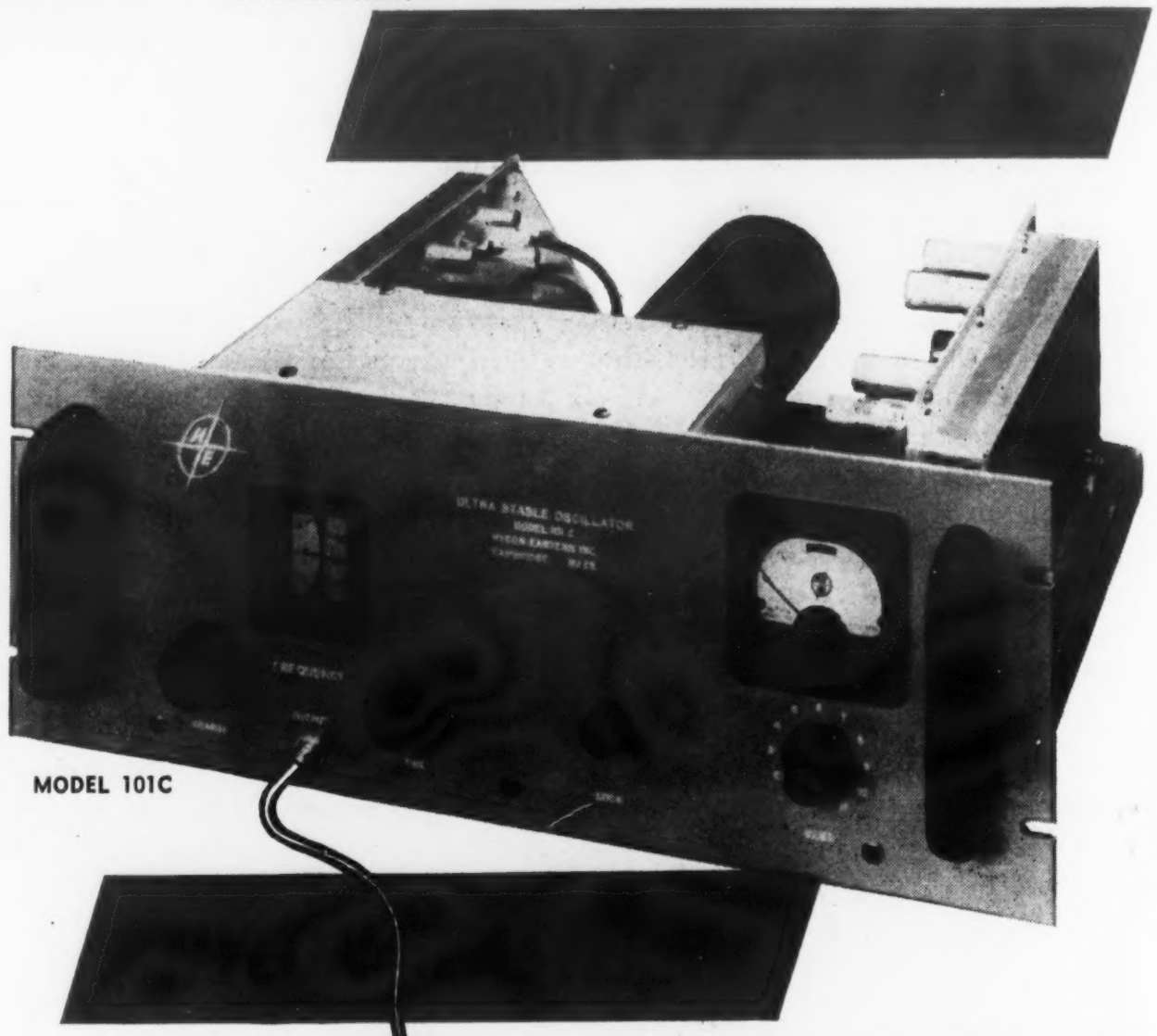
"Operation Bootstrap"

"Operation Bootstrap," the Commonwealth's industrialization program, however, is making inroads on this mass unemployment. Since 1948, it has succeeded in bringing 402 U. S. branch plants to Puerto Rico, creating direct and indirect employment for 60,000 persons on the island. But the fact remains that 20,000 Puerto Ricans reach working age each year, meaning that Bootstrap still has a long road to travel before it begins to rid the Commonwealth of its economic ills.

The U. S. electronics industry is certainly doing its share. Typical is Caribe Aircraft Radio Corp., the island's first aircraft components plant, which sells most of its production to the U. S. Armed Forces. Caribe Aircraft Radio recently completed an expansion to include a new line of complex circuit testers, radar receivers, and a new model oscilloscope. Except for General Manager Stephen Austin, Caribe's staff, which numbers over 100, is Puerto Rican at all levels. When the company started in 1952, it interviewed more than 100 local people and selected a dozen for its pilot operations.

According to Austin, it was at this point that Caribe made its first mistake. Since most of the employees had no experience in electronics, or even in manufacturing, Caribe began by drastically oversimplifying everything; for instance, Austin showed them just how to coil wire, a single strand at a time. The workers rapidly lost interest. Then as an experiment, Caribe tried the opposite approach—letting workers loose immediately on the complex electronic equipment and carefully showing them exactly how it was created. "It worked, and this has been the method used ever since," Austin said. The Caribe plant manager added that Puerto Rican workers possess unusual manual dexterity and precision and are capable of both long and short production runs, given the proper instruction. "Moreover," he said, "they take interest in their work long after comparable mainland workers get bored."

NOW! a Precision Frequency Source



Hycon Eastern's new Ultra Stable Oscillator is a one megacycle signal source of exceptional stability. It is useful wherever precise time measurements or frequency control are required, as in reinsertion of carrier in suppressed carrier systems, telemetry, astronomical measurements, navigation systems, geophysics or other critical applications.

Write for Ultra Stable Oscillator Bulletin

STABILITY: 1 PART IN 10^9

- **FREQUENCY STABILITY: DRIFT RATE LESS THAN 1 PART IN 10^9 PER DAY AFTER ONE MONTH'S OPERATION.**
- **FREQUENCY: 1 MEGACYCLE, VARIABLE OVER A RANGE OF 1 CYCLE. AVAILABLE AT OTHER FREQUENCIES ON SPECIAL ORDER.**
- **CRYSTAL OVEN: STABILIZED TO BETTER THAN 0.01°C BY TEMPERATURE-SENSITIVE RESISTANCE BRIDGE. OVEN CONTAINS NO MOVING PARTS.**
- **DISSIPATION IN OSCILLATOR CRYSTAL: STABILIZED AT A POWER LEVEL LESS THAN ONE MICROWATT.**
- **2 OUTPUTS: SINE WAVE—4 VOLTS RMS; PULSE—1 VOLT.**
- **OUTPUT IMPEDANCE: APPROXIMATELY 250 OHMS.**
- **POWER REQUIRED: 150 VOLTS, 100 MA, REGULATED DC, AND 6.3 VOLTS, 3 AMPERES, AC OR DC. (Matching Power Supply available)**

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Carborundum's electronics affiliate in the West Coast City of Mayaguez is another successful operation. The affiliate has been in Puerto Rico for little more than a year and already has completed a sizeable expansion, including an abrasives plant next door. Rising productivity and new equipment, reported plant manager R. H. Hau, should result in a three-fold production rise within five years, largely as the result of an intensified employee training program.

Caborundum of Puerto Rico's electronics facility takes up 20,000 square feet of space and produces Kovar-glass seals for electronics parts, capacitors, and printed circuits. The other, a 23,500 square-foot installation, produces internal grinding and mounted wheels for abrasives. Carborundum already has introduced a new product line at its electronics plant: high-temperature ceramics for use as heat and electrical insulators. New resins and finishers are being produced at the adjacent abrasives unit.

"Rising productivity and efficiency of my workers," Mr. Hau said, is encouraging Carborundum to give "full rein" to use of latest and most complex types of production techniques and equipment. Mr. Hau was born in Mayaguez and returned to his home town following service with the parent company in Niagara Falls, New York.

Puerto Rico is developing more than reliable, well trained precision workers on the production level. It is creating a cadre of technicians and engineers to supervise these workers.

Carborundum, for example, has implemented an unusual in-plant training program by extending an invitation to engineering students at the nearby Mayaguez School of Engineering to get-on-the-job experience by using idle machinery. Most of Carborundum's supervisors are graduate engineers from the same school.

Where do Puerto Ricans get their basic training? In many cases from one of the 11 new vocational schools on the island which each year graduate 6,500 trainees well versed in a specific vocation—from cooking to aviation mechanics. On a more technical level, the University of Puerto Rico turns out engineers from one of the few technical schools of its size south of the border.

With the growth of this industry have also come integration and more local supplies for the new electronics manufacturers in the island. Local manufacturers, some of them U. S. affiliates, now make such products as steel wire and wire products, screw machine products, construction materials, tool and die work, die-casting, compression and injection-molding of plastics.

Rapid Industrial Growth

Ten years ago, Puerto Rico was creaking along on a sugar and tobacco economy. Today, through the miracle of 20th century industrialization, this self-governing commonwealth is succeeding in its attempt to improve the living conditions of its 2¼ million people.

At the same time, U. S. electronics manufacturers have an unprecedented opportunity to establish branch plants in an area closely associated with the United States, within its tariff wall, yet exempt from Federal taxes.

To my mind, the situation appears particularly promising to electronic companies west of the Mississippi who are now considering expansion in order to tap east coast markets. The fact that 35 U. S. mainland electronics affiliates have already been established in Puerto Rico in the past ten years aptly illustrates that major companies in this field are not ignoring this opportunity.

Shown above are employees at Weston Electrical Instrument's Puerto Rican affiliate, who are assembling light meters and testing meter components. Weston has a $1½-million business annually from this island branch. The 15,000 square-foot installation is completely air conditioned. With the exception of the general manager, all 165 employees are Puerto Ricans, including the accountant and the office manager. The entire production of Weston's precision electrical instruments, electronic and testing equipment, is guided by supervisors and technicians who are natives of the local area.

"THERE'S A BEAUTIFUL EARTH OUT TONIGHT"

These words will be spoken by a traveler from the planet Earth—and the speaker is alive today.

A whole new science of astronautics has come into being in the past decade. And today at Martin, thousands of engineering man-hours are daily being devoted to the development of guided missiles, rockets and flight systems of vital importance to the security of our country—and to the future of astronautics....It's sooner than you think!

MARTIN

BALTIMORE · DENVER

project Vanguard

A Progress Report

— PART II

by Dr. John P. Hagen and Charles DeVore

Part I of this article on the Earth Satellite Program appeared in the September-October issue.

THE ELECTRONIC SYSTEM KNOWN as radio telemetry will be one of the important tools to be used in launching the earth satellite. Donald G. Mazur, in charge of this phase of the work at the Naval Research Laboratory, explained recently that telemetry will be used first of all in the test phases of the VANGUARD program, long before an attempted launching, to obtain performance data on the three rocket stages individually as well as in combination. To assure reliable performance of the system, according to Mr. Mazur, some of this information must be obtained with an accuracy of at least one per cent. With the advent of the first launching attempt, an abrupt transition will be necessary in the telemetering equipment, as the emphasis shifts to obtaining the barest essential information, using one or two lightweight transmitters.

Several systems are being considered, the equipments including pulse position modulation, frequency modulation, and pulse width modulation commutation devices. Because of the time factor and the extreme importance of equipment reliability in this operation, each of the systems whose use is being contemplated, has seen service in other rocket programs. Here again, there is the guide of experience; with telemetry in the Viking rocket program, for example, successful operation of telemetering equipment was achieved throughout the entire flight of a firing in 1954 which reached a record altitude of 158 miles. But in the present ap-

1. Minitrack transmitter.
2. Meteoritic collision amplifier.
3. Meteor storage memory unit.
4. Telemetering coding system.
5. (not visible) Lyman alpha memory storage unit.
6. (not visible) Lyman alpha current amplifier.
7. Mercury batteries power supply.
A. Solar cell peak memory reset.
B. Ion chamber.
C. Thermistor.
D. Erosion gauge.

Pictured at the right is a single-stage, crystal-controlled, transistorized oscillator, with a 10-mw output, weighing 13 ounces, complete with seven 1.2-volt mercury cells. It was developed by scientists at the Naval Research Laboratory for use in the earth satellite. Operating at 108 mc, this transmitter has a potential broadcast range of more than 4,000 miles.

Above: John T. Mengel, head of Project Vanguard Tracking and Guidance Branch at the Naval Research Laboratory, examines the assembled Minitrack transmitter pack and an exhibition model that was constructed on a clear plastic sheet so that the components are clearly visible after assembly. The model closely resembles the actual Minitrack transmitter. The real transmitter, which Mr. Mengel is holding in his left hand, is assembled in a gold-plated aluminum container.

plication, there is the additional problem of transmission and reception of signals over a slant range which will be well over 300 miles during certain phases of the launching vehicle's trajectory. To add to the complexity of the problem, several ground receiving stations, spread out over a thousand miles, must be operated simultaneously and must provide dual or overlapping coverage, with each station an important link.

Once a satellite has been placed in an orbit, radio will be called upon to handle three additional jobs: (1) to prove that the satellite is orbiting (acquisition); (2) to determine its precise orbit (tracking); and (3) to measure what is happening in the satellite, from the vantage point of a ground station.

Tracking and acquisition will be perfomed using a system of radio angle tracking developed at the Naval Research Laboratory, known as "Minitrack." John T. Mengel, who is in charge of the radio tracking program, describes the tracking and acquisition problems in this way:

"Let a jet plane pass overhead at 60,000 feet at the speed of sound, let the pilot eject a golf ball, and now let the plane vanish. The apparent size and speed of this golf ball will closely approximate the size and speed of a satellite 3 feet in diameter, at a height of 300 miles. (His comparison, incidentally, also points out the difficulty presented for visual, or optical tracking.) In the case of an actual satellite, the initial launching

(*Continued on page* 24)

ANOTHER EXAMPLE OF:

What our creative engineering can do for you

Creative engineering is evident in the Stabilized Communications Transmitter — Stacot — which Westinghouse designed and is producing for the U. S. Navy. Take the accessibility feature shown at right, for example. Each major unit pulls out like a drawer and rotates about its horizontal axis to permit access to all four sides for checking and servicing. In effect, the transmitter serves as its own workbench. Simple? Yes — but to the electronics technician working in the close quarters of a radio room it seems like a stroke of genius.

To achieve *reliability*, the Westinghouse design philosophy is based on simplicity. For example, the number of electron tubes has been reduced by 30% from existing comparable transmitters.

Design achievements such as these, and there are dozens more in Stacot transmitters, are typical of the creative imagination that goes into every electronics design problem Westinghouse tackles. These jobs are our meat because of the breadth of experience Westinghouse has — not only in communications, but in every phase of electronics. Name your problem — we have both the highly imaginative young engineers and experienced electronic pioneers to solve it. Write or phone today. Westinghouse Electric Corporation, Electronics Division, Baltimore, Md. Telephone EDmondson 6-2300.

J-02301-X

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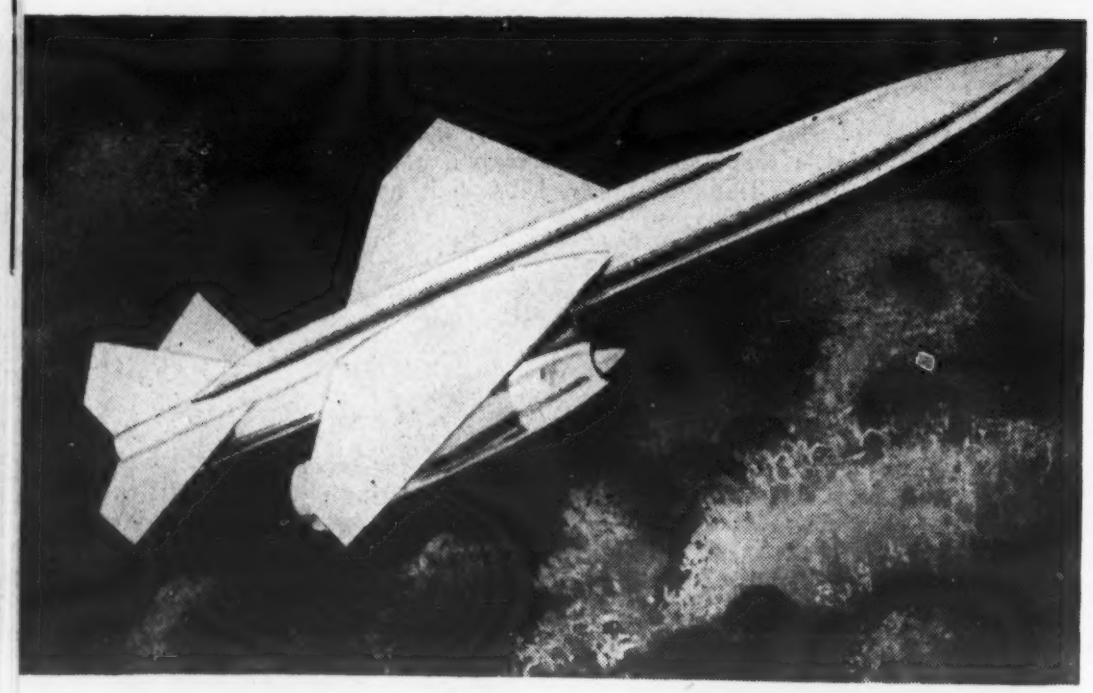
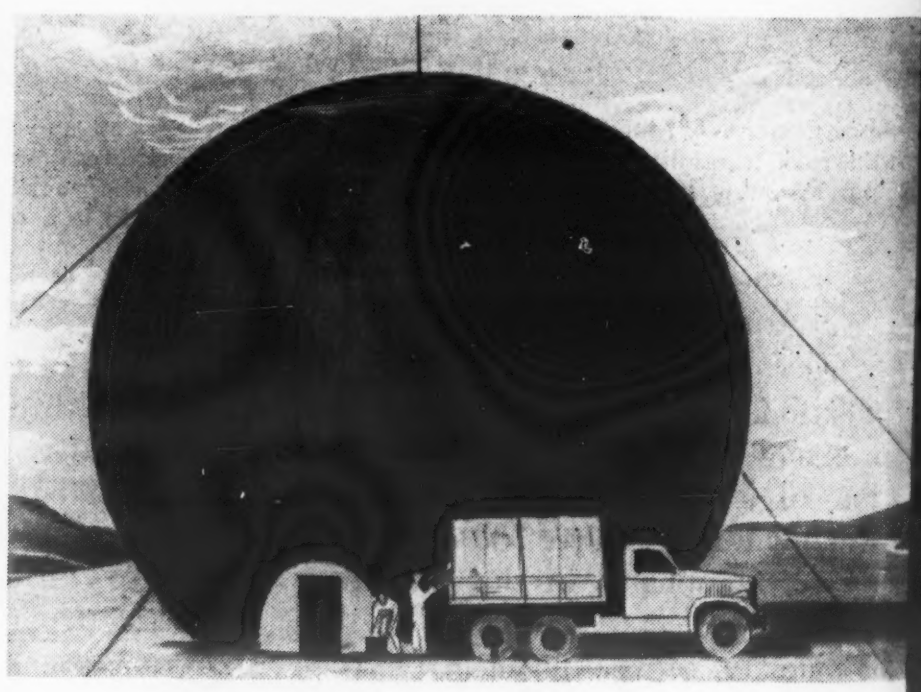
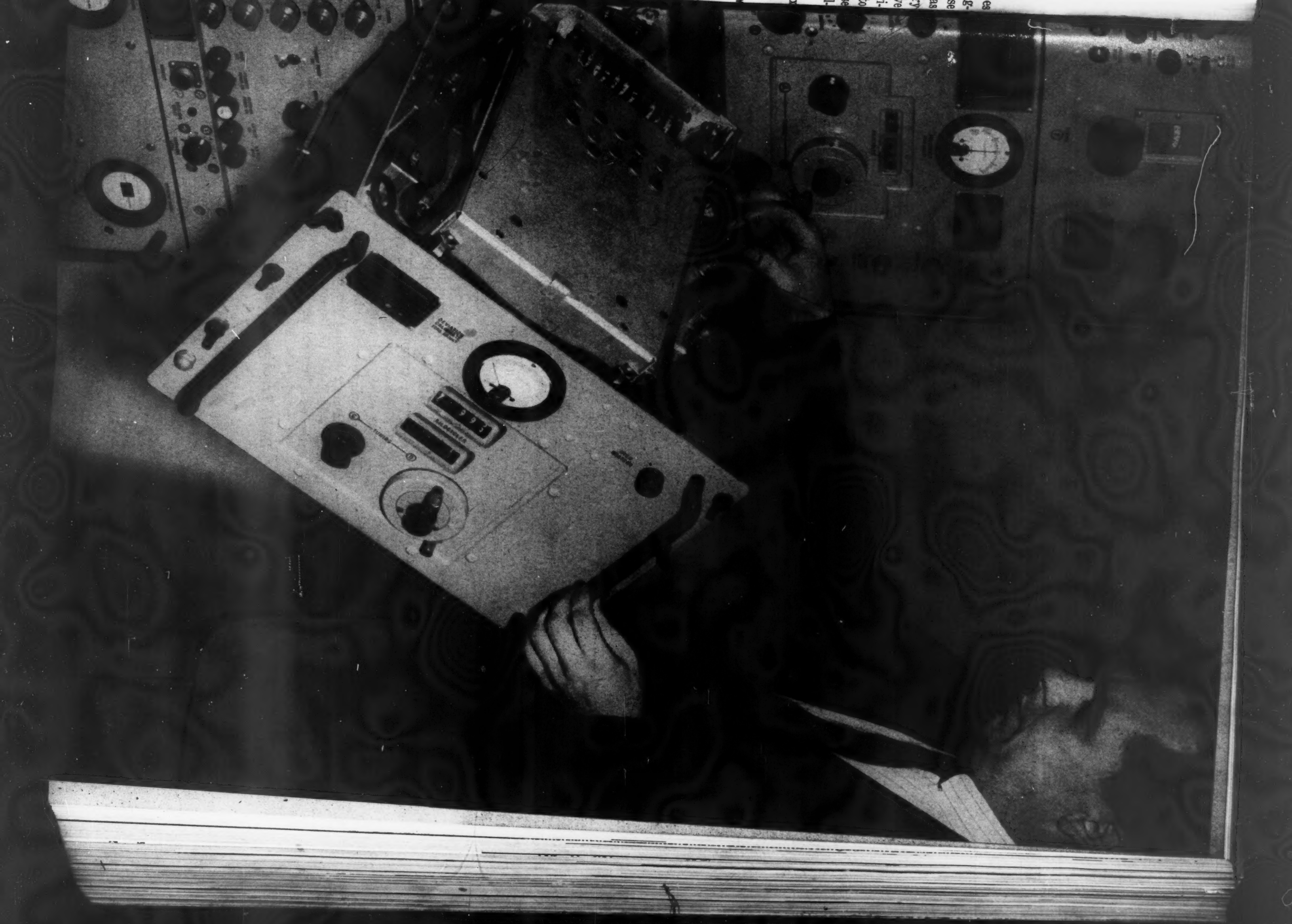




DEVELOPMENTS FOR THE AIR FORCE AND ARMY

Westinghouse was selected to develop the ground control mechanisms for the Boeing ground-to-air missile because of extensive experience in all the required fields. The system involved data gathering, transmission, display, evaluation and weapon assignment.

Westinghouse-developed "piggyback" radar solves the problem encountered in Korea where radar was either too far back to do any good or in danger of capture. By eliminating cumbersome equipment, the Westinghouse design permits portability never before attained.



information, such as time of launch, direction of launch, and first and second stage tracking data, could localize the time of arrival of such a sphere over any given ground location to within six minutes, and its position to within several hundred miles, during the initial orbit. The acquisition problem is to locate the object under these conditions, and the tracking problem is to measure its angular position and angular rate with sufficient accuracy to alert non-acquiring tracking stations (optical, for example) as to the time and position of expected passage of the object."

The Minitrack system, while a sophisticated one, makes use of established radio interferometric principles. It utilizes a transmitter of minimum size and weight within the satellite to send a beam of radio energy to receiving antennas at ground stations. By comparing the path length from the transmitter to one antenna with the path length from the transmitter to a second antenna, it is possible to locate the satellite in its orbit, determining its angular position by radio phase-comparison methods. Similar measurements with another set of antennas, at right angles to the first set, help to fix the satellite accurately. In the actual ground tracking stations, seven antennas will be used. Six separate items of data will be obtained in this manner, sent to a central computing facility within 20 minutes of receipt, and used there for determining the orbit of the satellite.

Assured Operation

Utilizing radio methods, this system is independent of essentially all weather conditions, visibility conditions, and time of day, so that operation is assured whenever the satellite is within the ground station antenna beam. An operating frequency in the VHF band, 108 megacycles, permits good efficiency with minimum weight components in the satellite, while at the same time providing reasonable antenna beam widths at the ground stations, with large collecting areas.

It is not surprising that John Mengel is confident of this system. He says: "It is not too unrealistic to predict that during a satellite event, the evening newspapers will publish on their front pages three boxes—one for the baseball scores, one for the horse race results, and one for the evening times and angles at which the satellite can be picked up!"

Telemetering of data from the satellite will also be accomplished through the Minitrack system. A method of ground command turn-on has been worked out so that the telemetering transmitter will send only when the satellite is directly over a ground station, thereby minimizing battery requirements in the satellite.

And radio amateurs, or, more probably, radio amateur clubs, may have read with interest of the "simplified" Minitrack system, recently described in detail in the magazine *QST*.

Component Testing

In September of this year, NRL placed in operation the first of ten radio tracking stations which will be located in North, Central, and South America. It is located at Blossom Point, Maryland, about 40 miles south of Washington, D. C., and will be used initially to evaluate the components of the Minitrack radio tracking system, as well as to train the operating crew for the other tracking stations.

Among the components being tested by NRL engineers and technicians at Blossom Point is the 10-milliwatt Minitrack transmitter developed by NRL for the earth satellite. This device is a single-stage, crystal-controlled, transistorized oscillator, powered by seven 1.2-volt mercury cells with an estimated operating life of two weeks. Operating at 108 megacycles, the transmitter has a potential broadcast range of more than 4,000 miles, and weights only 13 ounces, complete. The thin aluminum container housing the oscillator is gold-plated to improve its properties as a heat shield.

Radio Tracking Stations

Besides the radio tracking station at Blossom Point, stations are planned for operation during the International Geophysical Year at these locations: San Diego, California; Santiago, Chile; Antofagasta, Chile; Ancon, Lima, Peru; Quito, Ecuador; Rio Hata, Panama; Havana, Cuba; Antigua, British West Indies; and Fort Stewart, Georgia.

Reasons for the Attempt

It may be well in conclusion to reemphasize at this point that the satellite project is a scientific program, aimed at putting a research vehicle in an orbit 200 to 300 miles above the earth. Scientists have a two-fold reason for making this attempt. First, it will enable them to make astronomical observations of electromagnetic radiations from the sun which do not penetrate the earth's atmosphere. Second, it will also allow them to determine the nature of the atmosphere itself; to study the incoming radiations and to relate them to the affected regions of the atmosphere, such as the ozonosphere and the ionosphere, and to the unusual phenomena in the atmosphere such as the aurora. In addition to adding to our stockpile of scientific knowledge, such new information, otherwise unobtainable, may be of practical value to long-distance radio communication, as well as to a better understanding of the weather and climate.

The first measurements will necessarily be crude, from a scientist's standpoint, because of the severe weight on instrumentation imposed by the size and weight of the presently comtemplated satellite. Nevertheless, the first satellite will be a research vehicle. All data will have to be telemetered back to the earth; there is no room in the present design for photographic film, its ejection and recovery, and recoverable satellites are not feasible during the IGY, at least.

Possibilities vs. Problems

The first successful launching of a satellite is certain to stimulate to an even greater degree the talk of manned space flight. It will be necessary then, as it is now, to remember that the practical problems involved indicate that such things are for the future. We first have much to learn, not only about conditions in outer space, but also about how to place even a small, unmanned, instrumented payload in a useful orbit.

Fire control radar tells... / WHERE TO AIM WHEN TO FIRE!

All-seeing radar pinpoints the target for these Air Force planes. Whatever armament they carry—guns, rockets or missiles—fire control radar tells them *where* and *when*. It provides the far-sighted vision necessary for modern long-range combat operations.

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RCA is a major supplier of airborne fire control equipment to the Armed Forces. Its activity in developing and producing these systems requires a close working relationship with the airframe industry and the Department of Defense, a "partnership" vital to the success of any weapons system.

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ELECTRONICS TRAINING... Key to Preparedness

by W. A. Robinson

TODAY, EACH SERVICE OF THE Armed Forces is a vital link in the defense of our Nation. Like a well organized team, the Army, Navy, Air Force, Marines, and the Coast Guard perform their separate and distinct duties, but they are linked together through the magic of one of the most remarkable of modern sciences — Electronics.

This relatively "young" field has reached a position of importance in the military service, and the various branches of the Armed Forces are faced with the problem of having a constant reservoir of well trained men and women who can install, operate, and maintain the growing list of electronic devices so essential to modern military operations. These devices may range from small "walkie-talkies," through radar and weapon control systems, on up to giant computers and guided missile control and communications equipment.

While the Service schools are doing a magnificent job of preparing personnel for such assignments, their problem would be greatly simplified if more incoming personnel had a basic knowledge of electronics *before* entering the Armed Forces.

Pre-Service Electronics

It is toward this goal that the DeVry Technical Institute and other private electronic training organizations are working. Through a nation-wide counseling service in high schools, and by contacts with individuals interested in training courses, our representatives are advising young people of military age, who are not planning to go to college, to secure as much training as possible in electronics *before* entering the Service. The results have been encouraging. Many young men and women are now developing skills which will be of great benefit to the Services and to themselves.

At the request of some Service branches, many high-grade technical schools are supplying a "Statement of Experience" to each student or graduate who enters military service. This statement, detailing the electronic training of the individual, is presented to the interviewer at the military classification center for consideration. The procedure has resulted in the early channeling of many qualified technicians into electronic assignments as soon as possible after basic training.

Resident Training Program

To prepare men and women for a wide range of careers in electronics, DeVry offers full-time training in well equipped residential laboratories or part-time training at home.

Resident programs range in length from 36 weeks to 96 weeks, depending upon the enrollee's objective. The training program is divided into units of 12 weeks, with each unit covering a major subject. The following programs are offered:

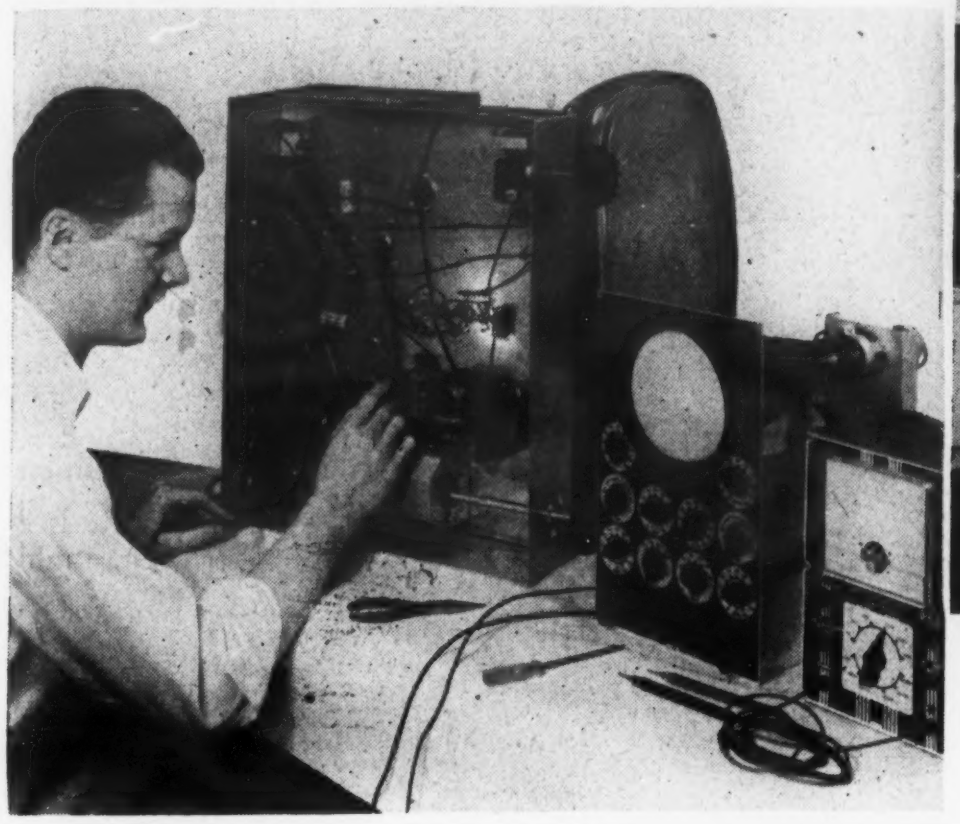
Television and Radio Servicing	36 weeks
Communications	48 weeks
Electronic Instrumentation and Control	72 weeks
Electronic Technology and Design	96 weeks

48-Week Program

In the 48-week program, for instance, the objective is "to prepare students for the communications field as commercial operators of Television-Radio Broadcast Stations, Ra-

Pictured above is the electronic instrumentation laboratory at DeVry Technical Institute. It contains a wide range of equipment which resident students use. These include many instruments used in the detection and measurement of nuclear (atomic) energy reactions. Resident programs range from 36 weeks to 96 weeks, depending upon the enrollee's objective.

Pictured below: A home student of DeVry Institute services a television receiver using a 5-inch oscilloscope and vacuum tube voltmeter which he built himself as part of his training.



Pictured above is a modern television and radio studio of DeVry Technical Institute which provides valuable on-the-job type of experience to men preparing for careers in broadcasting and communications. Resident students operate television cameras, video controls, tape recorders, transcription turntables, monitors and generators of the same type found in commercial stations.

dar Systems, and 2-Way Radio-Telephone Systems." The program, consisting of four units, includes: Fundamental Electronics, Television Principles and Radio Servicing, Television Servicing, and Communications. Also included as a general subject is the preparation for the Federal Communications Commission examination for First Class Radio-Telephone Operators. Students spend much of their time in the laboratory, training on actual electronic equipment similar to that found in the field.

For the home training program, DeVry provides a student with clearly written texts, many shipments of electronics equipment for practical experience, and the use of specially prepared motion pictures illustrating important basic principles. He is loaned a manually operated motion picture projector so that he may view, review, and study the subject matter presented in films at a time convenient to him. This latter feature of the training has been praised by many educators and was even cited on the floor of the House of Representatives in Washington as an outstanding achievement in the home study field.

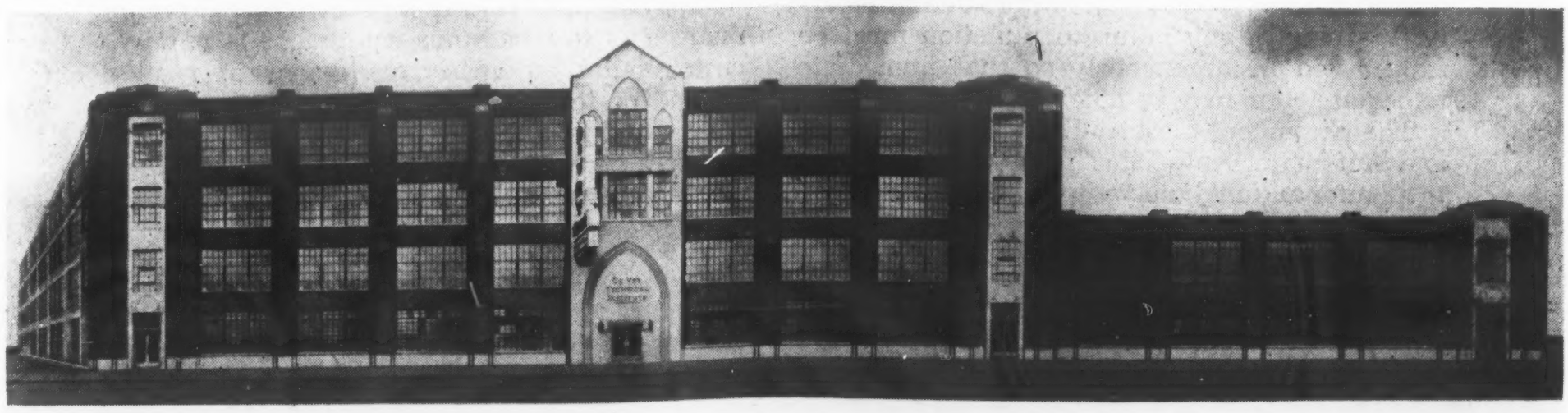
Armed Forces Program

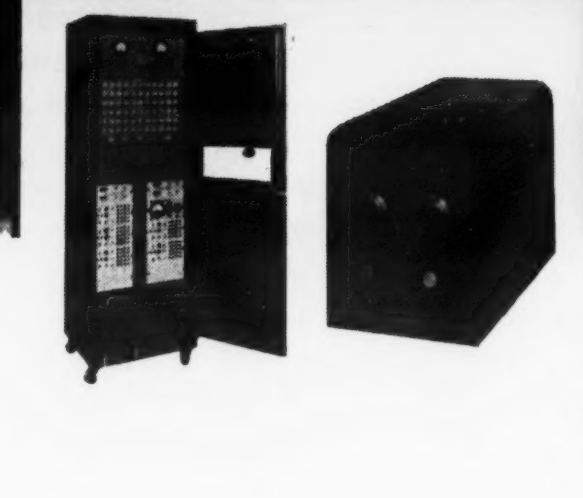
Many members of the Armed Forces are currently enrolled in the home program, carrying on their studies during off-duty hours. Through this method, they are receiving training in Television and Radio Servicing, Communications, and Electronic Instrumentation and Control. Also, another separate program is being offered in Automation Electronics. Those enrolled have found the home study method an excellent supplement to the electronic training they are receiving in the Armed Forces.

The aim of these training programs is to provide enrollees the knowledge which they will need to carry on a successful career in electronics, whether it be in the Armed Forces or in private industry.

Through such a wide scope of training operations, DeVry Technical Institute is attempting to do its share in helping the United States maintain its position as the best prepared Nation, and truly a land of opportunity.

Pictured below is DeVry Technical Institute. Considered one of the best equipped training centers of its kind, it has two acres (100,000 square feet) of classrooms, laboratories and offices.





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Checking out guided missiles is only one of many uses to which our equipment is put. We custom-build automatic equipment to meet a myriad of testing requirements for the Armed Forces and for industry.

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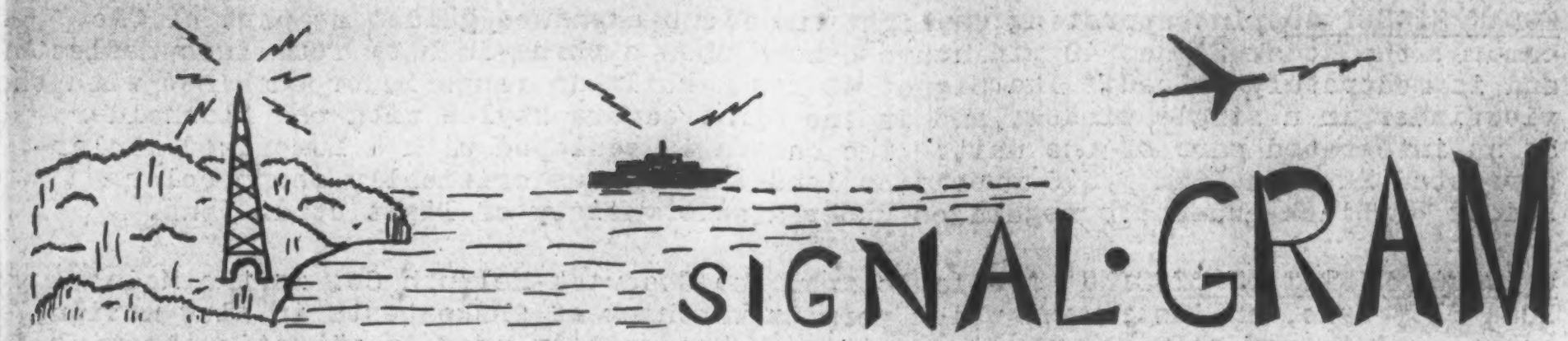


— GOVERNMENT —

NEW AM TECHNIQUE FOR AIR FORCE Designed to meet the needs of long-range military radio operations, a new radio technique, synchronous communications, is available from the General Electric Co., which developed it under contract to the Air Force Research and Development Command. Basically a refinement of the conventional AM radio, the new technique eliminates the carrier and uses both sidebands—allowing the signal to travel "in parallel" to aid clear reception and resist jamming.

AIR FORCE TEST ROCKET The U. S. Air Force has developed a research rocket that reaches several times the speed of sound in just two seconds. Called the Hypersonic Test Vehicle (HTV), it was designed as a free-flight research tool to gather data at hypersonic speeds. These data include information on aerodynamic heating, aerodynamic shapes, and air pressures.

NOL INSTRUMENT LOAN LIBRARY A unique supermarket loan library for precision instruments has been set up for the Naval Ordnance Laboratory project workers by the Instruments Standardization Division of the Technical Services Department in the White Oak, Md., laboratory. From the Instrument Issue Branch of this newly organized division, project workers may borrow what they need from a stock of nearly 13,000 calibrated instruments valued at over $5 million. To insure the accuracy of all instruments used, the Instrument Repair and Calibration Branch calibrates all instruments received before going to stock.

AF OBSOLETE EQUIPMENT FOR RESALE A study, with resale in mind, of $5 million worth of obsolete, heavy-duty electronic equipment is being made by experts in the electronics field for the Materiel Redistribution and Marketing Division, Air Materiel Command. Although obsolete for the Air Force, much of the equipment embodies advanced principles not yet introduced into equipment available to the public, and the study is being made to assist in the development of uses and adaptations to expand the marketability of the equipment.

— INDUSTRY —

FREQUENCY DEVIATION METER To be used in developmental and production testing of FM and AM transmitters and signal generators, a Frequency Deviation Meter, which can measure FM and AM modulation characterististics over a range of carrier frequencies from 20 to 600 mc, is available from the Federal Telephone and Radio Company. Designated Type FT-FMV, the meter simultaneously indicates the incidental AM in an FM signal, or the incidental FM in an AM signal.

READIX CAN PREDICT FUTURE An electronic brain developed by the J. B. Rea Co. is being used by the company to predict future profits or losses. The first of these computers was delivered to the Air Force in February, with the second going to DuPont Co. Ad additional READIX has been ordered by the Air Force.

NEW RECEIVERS FOR CONTINUOUS MONITORING Two new FM receivers have been designed for dependable, 24-hour duty wherever monitoring of two-way broadcasts is a must. They are available from Monitoradio Division, I.D.E.A., Inc. The "Signal Master" is the first crystal-controlled, fixed-frequency receiver ever offered at popular price, with 3 mv sensitivity for 10 db signal-noise ratio resulting in powerful, long-range reception. Another instrument introduced for those who want a tunable version of the "Signal Master" is called the "Minute Man." Both instruments come in two models.

KODAK SIGNET 40 Incorporating daylight and flash exposure guides as part of the camera, the Kodak Signet 40 miniature camera uses a three-inch or four-inch reflector, and is moderately priced. The Signet 40 has a built-in rangefinder combined with the viewfinder in a single window, and is the first camera styled with the flasholder as an integrated part of the unit. The camera is equipped with a Lumenized, color-corrected Ektanon 46mm f/3.5 precision lens which gives critically sharp color slides or black-and-white negatives under a wide variety of light conditions.

UNIT FOR VIBRATION TESTING Available from the Chadwick-Helmuth Co. is the Model 103A Slip-Sync, an instrument which permits watching of shake tests in slow motion, or stopped in any selected cyclic position. The unit is used in vibration testing of electronic equipment for aircraft or guided missiles, or wherever vibration is a design problem. While conventional vibration testing techniques yield only the fact of failure, the Slip-Sync shows the exact cause of failure.

CANADA-BENDIX AVIATION EXCHANGE Bendix Aviation Corporation has purchased a 40% interest in Computing Devices of Canada Limited, of Ottawa. The purchase agreement includes a sales and licensing agreement under which the Ottawa firm will handle numerous Bendix electronic products and missile components and will exchange engineering developments. The Bendix-CDC arrangment covers missile components of all kinds, telemetering, radio communication equipment, mobile radio, and several new Bendix electronic developments for industry, such as the Lumicon light-amplifying device, the mass spectrometer, nuclear and and dosimeter gauges, and meteorological equipment.

LOCKHEED TO PRODUCE NEW JETS The fifth multimillion-dollar contract for manufacture of jets has been awarded to Lockheed Aircraft's Marietta, Ga., Division for the manufacture of C-130 Hercules propjet transports. The propjet is a versatile military carrier that airlifts 20 tons or 92 troops. Powered by four Allison T-56 turbine engines, it can air drop paratroopers and heavy equipment, and is the fastest Air Force transport in operation with a top speed of over 370 mph.

NEW NAVY MISSILE CONTRACT TO RAYTHEON The Navy's Bureau of Aeronautics has awarded a contract for more than $60,000,000 to the Raytheon Manufacturing Co. to produce air-to-air guided missiles for Naval Aviation. Raytheon, one of the Nation's largest companies devoted exclusively to electronics, has pioneered during the past ten years in the development of missile systems and components.

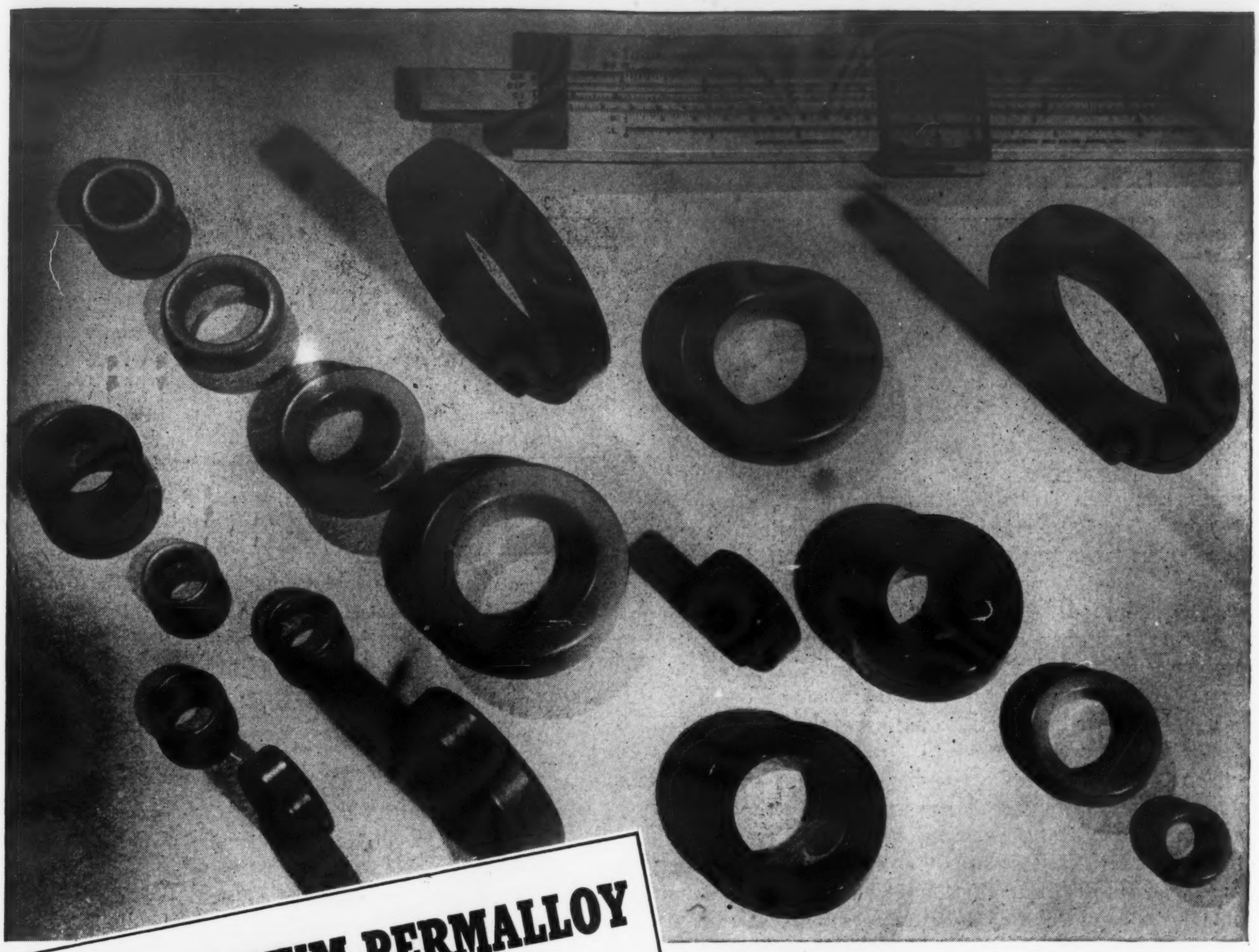
— GENERAL —

NEW MAN-MADE MINERAL Sintox, an inexpensive, man-made mineral produced by Sintox Corp., can be used in electronic and electrical fields, as well as in the machining of metal, paper, and rubber, and in aircraft and automobile production. Its use may lessen the need for importing such strategic minerals as tungsten, and its dielectric strength is twice that of porcelain.

MOLDABLE LEAD COMPOUND A lead-plastic compound, suitable as shielding for radioactive materials and capable of precision molding in any shape within a tolerance of ± .0005 with extremely low tooling costs, has been produced by Telectro Industries Corp. Called "Leadcast," the compound can contain any amount of lead up to 95% by weight and vary in hardness from a semi-rubberlike material to one like cast aluminum, with greater structural rigidity than pure lead.

RADIO WAVES FROM MARS Radio astronomers at the Naval Research Laboratory in Washington, D. C., have for the first time detected radio waves from the planet Mars with the 600-inch radio telescope. Measured at a wave length of 3 centimeters, the waves indicate an average temperature for the red planet slightly lower than the freezing point of water.

COMPUTER SYMPOSIUM What is new in the use of electronic computers in business and industry was discussed at a symposium sponsored by the Armour Research Foundation of the Illinois Institute of Technology in Chicago on October 9 and 10. Attention was concentrated on the medium-sized machines. Activities including the petroleum, electrial and chemical industries, light and heavy manufacturing, stock brokerage operations, personnel classification, insurance, and research were the principal fields covered during the symposium.



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(New technical data now available)
Write for Bulletin PC-104B, dated October, 1956

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AVIONICS

Capt. W. E. Sweeney, USN,
Director, Avionics Division,
Bureau of Aeronautics

THE LAST 15 YEARS HAVE BEEN HIGHLIGHTED BY AT least two phenomena which have had a profound influence on the aircraft industry. One has been the rapid advances in the aeronautical art itself; the other has been the mushroom-like growth of the technology of electronics and the ever-increasing use of electronic devices in the airplane. These phenomena have brought into vogue such terms as "system concept," "weapon systems," "system manager," and so on. While no exception can be taken to the use of these terms, it does seem that some confusion can be attributed to the lack of specific definition.

Just as these phenomena and terminology have created problems of organization (crudely called "cognizance fights" in impolite society) in the industry side of the national defense partnership, so have there been difficulties in the Service agencies.

The Bureau of Aeronautics has, for some time, been studying these problems. There has been a strong awareness that the existing organization was not the optimum. Not only were Fleet personnel uncertain as to the best single source of information on a given technical matter, but also relationships with contractors, with other Services, with other Bureaus of the Navy, and even within the Bureau of Aeronautics, were difficult and unwieldy.

Although the organizational changes subsequently effected to obviate these difficulties were bureau-wide, we are here concerned only with the changes involving the fields of armament, electronics, fire control, and navigation; and these specifically in the research and development phase. The close inter-play or closed loop relationship between these components, sub-systems, and systems is quite obvious. For example, in the case of an airborne bomb director in the past, the system might be developed by the Bureau of Ordnance; a BuAer (Electronics Div.) radar might be modified and used. Navigational features of the system would duplicate, in many respects, navigational features of systems developed by BuAer (Airborne Equipment Division), and the installation of the system would be the responsibility of the Bureau of Aeronautics (Armament Division).

Necessity for the Division

From industry's point of view, there was no single office in the Navy where detailed technical knowledge, authority, and responsibility were centered. This made it difficult for industry to conduct its technical business with the Navy. From the Navy's point of view, the span of control was too wide—at all levels of command. The Chief of Naval Operations had to look to both BuAer and BuOrd for the bomb director—airplane system. The Chief of the Bureau of Aeronautics had to look to both his Assistant Chief for Research and Development and to the Chief of the Bureau of Ordnance. The Assistant Chief for Research and Development, BuAer, had to look to his Aircraft, Airborne Equipment, Armament, and Electronics Divisions.

One other major problem contributed to the difficulties of daily operations. This was the constant occurrence of "fire drills" requiring technical presentations, budget preparations, budget defense, and numerous other urgent demands for data, and material concerning the activities in BuAer.

Results of R&D Studies

Intensive study of these matters within the R&D Group of BuAer and consultations with members of the aircraft, armament, and electronic industries, led to the conclusions that a change in organization involving the Airborne Equipment, Armament, and Electronic Divisions, with special emphasis on *system considerations* and intensive *planning* would do much to eliminate many problems. An improved organization, which in many ways borrowed from the experiences of industry, will (1) make it easier for industry to obtain answers and decisions by establishing single places for responsibility and authority, (2) reduce the span of control for senior naval officers, (3) generally improve the efficiency of operation. The emphasis on planning will insure the continued availability of comprehensive short- and long-range plans from which presentations of any desired nature can be made on short notice, and will facilitate review of programs at all levels to insure soundness and purpose.

Before describing the organizational changes, it should be emphasized that the new Bureau of Aeronautics R&D organization in the fields of armament, electronics, fire control, and navigation is manned by the same personnel previously engaged in these fields, the programs and funding levels are fundamentally unchanged, and any changes which have already occurred or may occur in the future will be due only to actual Fleet requirements.

The reorganization which took effect on August 15. 1956, involved the following actions:

(1) A new division, called Avionics, was established.

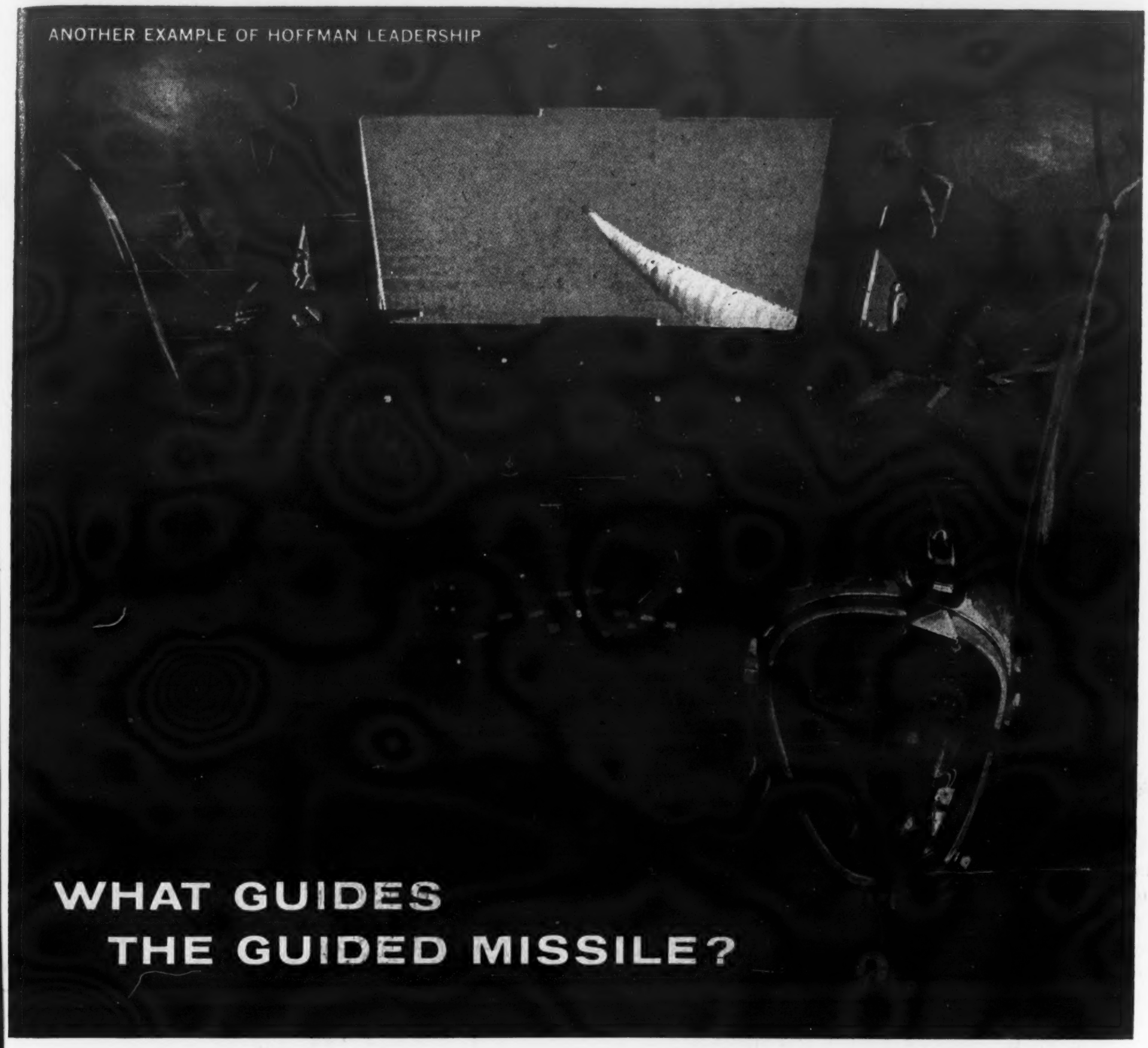
(2) The Armament and Electronics Divisions were dis-established, and the main body of personnel from these divisions formed the Avionics Division.

(3) Navigation was transferred from the Airborne Equipment Division to the Avionics Division.

(4) Tow Targets and Armor (previously in the

The Editors of SIGNAL *wish to express their thanks to Capt. W. E. Sweeney, USN, Director of the Avionics Division, BuAer and Dr. L. H. Glasman, for making this article about the newly formed Division available for publication in* SIGNAL.

ANOTHER EXAMPLE OF HOFFMAN LEADERSHIP



WHAT GUIDES THE GUIDED MISSILE?

Air-to-air missiles must be guided from the mother plane during that brief interval between the closing of the firing switch and the instant the missile locks on its target. This is the critical moment when a success or failure depends upon the exactness with which computers in the mother plane direct the missile's flight. This is the moment when nothing is as vital to the kill as the precision voltage reference system controlling the computers.

For jobs like these, electronic manufacturers have learned to depend upon Hoffman Semiconductor Zener Reference Diodes. Engineered for use in all types of precision power supplies, these amazingly rugged silicon junction components typify the continuing leadership of Hoffman in the semiconductor field.

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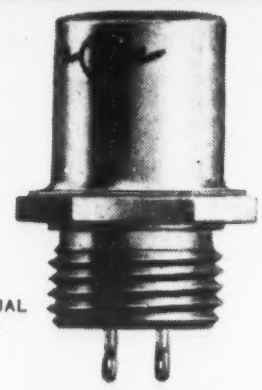
Whether for analog and digital computers, missile control, telemetering, limiting, clipping, voltage regulation or power supplies where size, weight and stability are critical requirements—Hoffman Semiconductor Zener Diodes are the indispensable voltage reference source.

Hoffman engineers will be glad to supply additional information on request.



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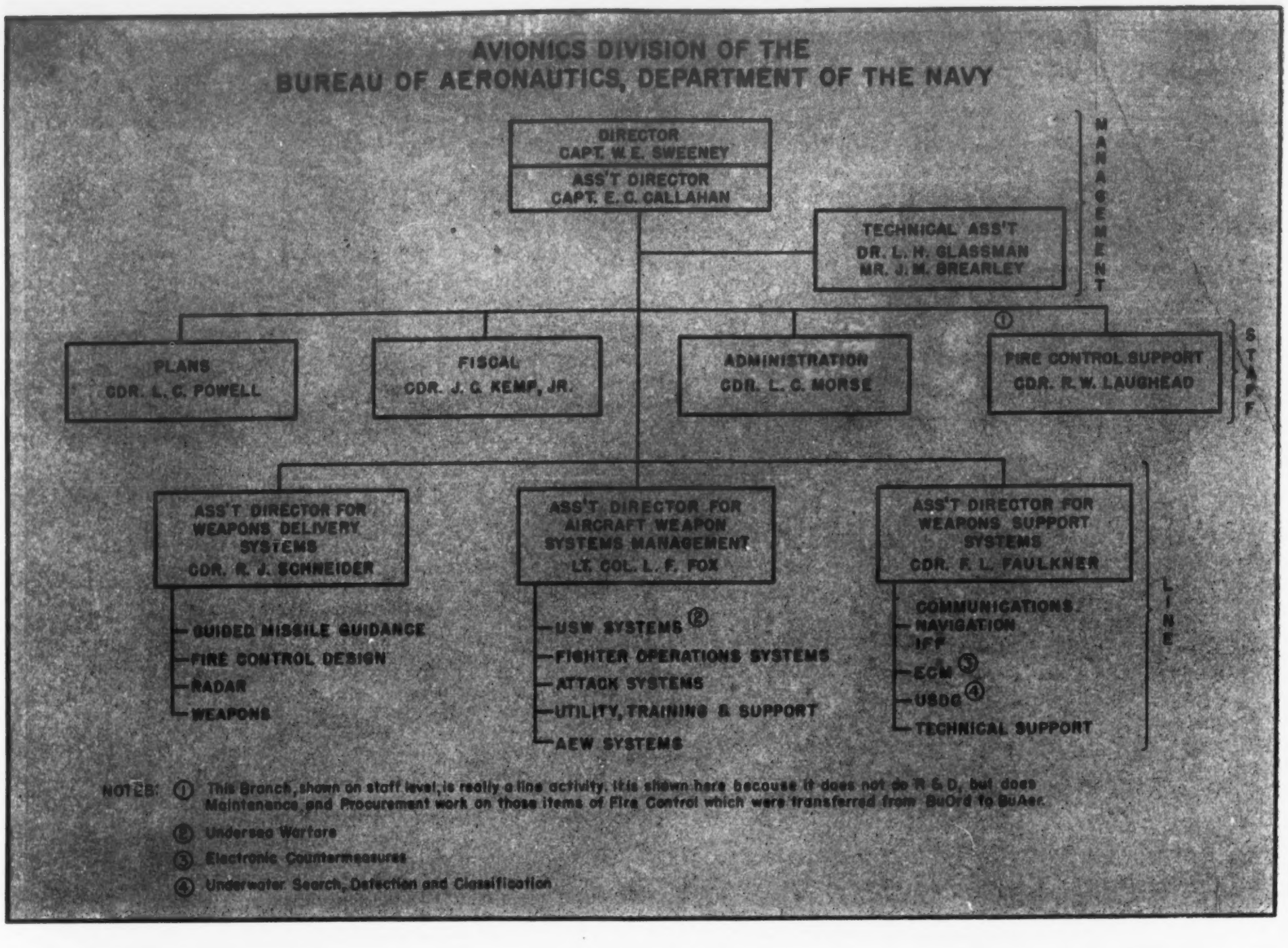
AVIONICS DIVISION OF THE
BUREAU OF AERONAUTICS, DEPARTMENT OF THE NAVY
DIRECTOR
CAPT. W. E. SWEENEY
ASS'T DIRECTOR
CAPT. E. C. CALLAHAN
TECHNICAL ASS'T
DR. L. H. GLASSMAN
MR. J. M. BREARLEY
MANAGEMENT
PLANS
CDR. L. C. POWELL
FISCAL
CDR. J. G. KEMP, JR.
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① FIRE CONTROL SUPPORT
CDR. R. W. LAUGHEAD
STAFF
ASS'T DIRECTOR FOR WEAPONS DELIVERY SYSTEMS
CDR. R. J. SCHNEIDER
GUIDED MISSILE GUIDANCE
FIRE CONTROL DESIGN
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ATTACK SYSTEMS
UTILITY, TRAINING & SUPPORT
AEW SYSTEMS
ASS'T DIRECTOR FOR WEAPONS SUPPORT SYSTEMS
CDR. F. L. FAULKNER
COMMUNICATIONS
NAVIGATION
IFF
ECM ③
USDG ④
TECHNICAL SUPPORT
LINE
NOTES: ① This Branch, shown on staff level, is really a line activity. It is shown here because it does not do R & D, but does Maintenance and Procurement work on those items of Fire Control which were transferred from BuOrd to BuAer.
② Undersea Warfare
③ Electronic Countermeasures
④ Underwater Search, Detection and Classification

Armament Div.) were transferred to the Airborne Equipment Division.

(5) The Electrical Branch (previously in the Electronics Division) was transferred to the Airborne Equipment Division.

By earlier Navy Department action, all aviation fire control had been transferred from the Bureau of Ordnance to the Bureau of Aeronautics (Armament Div.) and thus is now a part of the Avionics Division.

Pertinent to an understanding of the mission of the Avionics Division, is the following suggested definition of "Avionics":

"Avionics is the technology concerned with the aircraft control system composed of equipment which assists or substitutes for the pilot in the task of locating air, surface, and sub-surface target; maneuvering to the position for attack; and the delivery of the weapon. Specifically, this includes location, detection, classification, navigation, communication, computation, control, countermeasure and release equpiment for all weapon systems. This applies to both aircraft and guided missile weapon system."

The accompanying chart shows in summary form the organization of the Avionics Division. A brief examination of this chart will indicate the following: the spans of control within the division are reasonably limited; the project manager type of organization is indicated by the formation of the Aircraft Weapons Systems Management Group; staff, and line groupings are delineated; and closely related technical functions have been grouped together as much as practicable. Not shown by the chart, because of space limitations, is the magnitude of the effort provided for in "Plans," where 12 officers and engineers have been assigned.

Captain W. E. Sweeney, USN, who is the first Director of the Avionics Division, is sensibly aware of the magnitude of the task confronting him. He is ably aided in his managerial functions by his Assistant Director, Captain E. C. Callahan, USN, and his technical assistants. Dr. L. H. Glassman and Mr. J. M. Brearley.

Staff work is divided among an Administrative Branch, a Planning Branch, and a Fiscal Branch. Administration remains essentially unchanged from its classical character.

The Planning Branch has the responsibility for coordinating BuAer R&D Avionics programs with other activities in the Navy and Defense Departments. Its function is to be constantly aware of new techniques and programs and how they may be translated into new requirements for weapons systems. The branch acts as liaison between Avionics and the Chief of Naval Operations, the Air Force, civilian agencies, and others, in work related to aviation electronics and weapons. The Branch continuously studies future demands on the military services, looking 10, 15, even 25 years into the future of technology and society.

The head of the Fiscal Branch can be compared to a comptroller in private industry. This branch is responsible for the budget and the program scheduling of the division. Each program is critically examined from the standpoint of both money and time.

Contractors are being asked to submit short-period reports to the Avionics Division, through the Fiscal Branch, similar to those prepared for their own comptrollers. It is hoped thereby to have a running record of technical progress and expenditures as well as an idea of what can be expected in the immediate future.

The Fiscal Branch is a decidedly new departure in R&D Division operation from which information can be gained useful to the planning personnel and to those supervising the technical programs. These operations should lead to much cleaner, more sharply defined management of Avionics programs.

Structure of Line Groups

Each line group is headed by an Assistant Director. The Aircraft Weapons Systems Director is responsible for combining individual components, sub-systems, and systems into single weapons systems for individual aircraft. This group matches aircraft research, development, and production with avionics production, research, and development. Its function is to look into the future and forecast trouble spots, and bring them to light. It will have the responsibility for matching schedules with progress and seeking or developing alternatives in the event of a possible future mismatch. This group will be working in terms of systems management—an entire airplane program being the sum total of many separate projects scattered throughout the division. The AWS director will work closest with aircraft contractors on the installation of equipment.

Formation of System

Another way of looking at this job would be to consider this group as composed of aircraft type branches, each branch being composed of project managers, each being responsible for the avionics system of an airplane. These managers "legally" cross over all division lines of authority and circumvent academic channels of authority to get the job done.

The Weapons Delivery Systems group is composed of two branches that were formerly part of the Armament Division and two others from the old Electronics Division. These branches have the responsibility for fire control, guided missiles, guidance systems, radar, and weapons systems. They work on the development, testing, and evaluation of new equipment. They prepare the specifications and provide the technical experts.

With regard to systems development, the director ties the elements of his four branches into discreet components and systems which are then picked up by the Aircraft Weapons Systems Managers for incorporation into the complete avionics system of an airplane.

Another assistant directorship has been set up for Weapons Support Systems. This group is composed of 4 branches concerned with communications, navigation, identification—friend or foe, countermeasures, and underwater search, detection, and classification systems. This assistant director is also responsible for technical support of the other branches involving such matters as development and application of test equipment, specification writing, and a multitude of miscellaneous occupations.

Another line branch, the Fire Control Support Branch, was transferred, intact, from the Bureau of Ordnance. It is charged with controlling production and maintenance of fire control support equipment. In terms of industrial organization, this is an operating department of the division.

Planning for the Future

Looking into the future, say 10 years in advance, planning must keep both abreast of current technology and close to the thinking of the scientists who deal in terms of future technology. Management people must be able to know when one part of a scheduled system is growing obsolete and should be replaced by a new technique—even before the research program for the system has been completed.

The ever-increasing speed of aircraft constitutes a major problem to all of the military Services. It may mean new frequencies for detection, new types of transmission, new techniques for detecting small, fast moving targets. The Super Constellation with the large antenna has introduced, for instance, a new approach to antenna design. The guided missiles field also is faced with the problem of speed. It is known that other countries have fast aircraft. Missiles will, therefore, have to become faster, have better maneuverability, and be able to seek the target with greater accuracy. Speeds of Mach 10 and altitudes of up to 100,000 feet are involved.

Other Navy bureaus are concerned with nuclear-powered ships. The Bureau of Aeronautics deals with effects of radiation on avionics systems and equipment as well as on nuclear warheads for guided missiles.

In measuring performance of avionics systems, the division works very closely with the other Navy bureaus and their field activities. The division is aided by BuAer field activities such as those at Patuxent River, Md., Pt. Mugu, Calif., the Naval Air Development Center, Johnsville, Pa., the Mine Countermeasures Facility at Panama City, Florida, the Special Weapons Unit at Albuquerque, New Mexico, and the U. S. Naval Avionics Facility, Indianapolis, Ind.

Reliance of BuAer on Industry

In conclusion, the Bureau of Aeronautics is definitely interested in what industry is doing in almost every area of its activity. The Navy relies on industry, for instance, to help look ahead. Since the Bureau of Aeronautics is a government agency, it has the advantage of being able to survey all of the industry and to be exposed to a composite picture formed by the whole galaxy of programs. Those that portend of possible breakthroughs in technology are quickly picked up, and, if possible, a certain amount of financial support is lent to that program. The Bureau of Aeronautics is very dependent on industry to keep it abreast and ahead of what is going on in the scientific world. If, by chance, the Bureau of Aeronautics should miss some ideas with potential, it would welcome having them brought to its attention.

PORTABLE RADAR STATIONS MEASURE AND DOUBLE CHECK 50 MILE READINGS IN SECONDS

For the *first time*, surveyors are freed from short-sighted optical equipment. Unlike old-fashioned surveying tools, the "radar ruler" pierces through fog, darkness or dense foliage, electronically pacing off distances of 1 to 50 miles, precise to within a few meters!

This new general-purpose surveying instrument was developed by Motorola's Military Electronics Laboratory for the Signal Corps Engineering Laboratories, Fort Monmouth, N. J. The entire operation can be handled easily and quickly by unskilled personnel.

This self-calibrating system uses two identical portable radar stations which bounce a signal back and forth thousands of times each second. High-speed computers automatically provide the data necessary to measure off the distance.

Here is just one more example of the equipment now being developed by Motorola for many varied military applications.

3 suitcases and a 25 ft. collapsible antenna comprise the entire equipment

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Communications Systems and National Defense

by Maj. Gen. Francis L. Ankenbrandt, USAF
Director, Communications-Electronics
The Joint Chiefs of Staff

THE GREAT IMPORTANCE TO THE U.S. NATIONAL DEFENSE posture of the extensive and efficient U. S. communications systems now in being, both civil and military, is undisputed, but is not too well understood in some quarters. To understand fully this great importance, a brief description of each element, of how it works and its relation to the other elements, should provide a good background. Then, a look at the whole, after looking at the various parts, will, I think, clearly show how essential our modern world-wide communications systems *in toto* are to national security.

First, let us look at the military networks. Each military Service has established its own communications system to meet its own *command* requirements. The systems of all three Services are thoroughly interconnected for flexibility and to provide for use by one Service of elements of another Service's system, if its own has a failure or disruption. The types of equipment used by the Services are compatible, and permit interworking with each other and with the commercial communications companies without difficulty. Similarly, procedures employed on the Service networks are jointly agreed, permitting messages to be transferred from one network to another or into a commercial network for onward transmission or delivery with minimum delay.

Major Relay Systems

Major relay stations are established in each of the geographical areas (United States, Central Pacific, Far East, North Africa, North Atlantic, Alaska, etc.), and these stations are interconnected by high speed and high capacity trunking circuits. In addition to their normal inter-geographical area relay function, these stations are connected to minor relay and tributary stations to provide message acceptance and delivery service to units and activities located within these local areas.

These systems not only handle large volumes of lower precedence administrative type traffic by relay, but also provide the basic circuitry for military air traffic control operations, collection and dissemination of weather information, fleet broadcasts, and other operational communications vital to the command of rapid and sustained military operations. Two new and expanding components are those for handling logistic data transmission for the Army and for the Air Force.

The three integrated Military Communications Systems are widely known as ACAN (Army Command and Administrative Network), Navy NTX (Naval Communications System) and Stratcom (U. S. Air Force Strategic Communications System). Each is extensive in scope and tailored to the mission of its own Service and the location of its own forces. Each is an essential tool of command and each is an integral part of the operational forces of its Service.

Necessity for Increased Channel Capacity

In the early days after establishment of the Department of Defense in 1947, the tendency was to consolidate the communications networks of the three Services wherever feasible, and to allocate channels from one Service to another, in order to economize as much as possible in personnel, real estate, frequencies, money, etc. This was a most commendable trend and was moving forward rapidly until the full impact of atomic warfare on the Nation was finally realized. So important have *instantaneous military communications in being* now become under this concept of warfare that the greatest emphasis has been placed since 1950 on increased channel capacity, reliability, and protection against an enemy's action of whatever sort. This trend has been followed to meet the greatly increased needs for direct channels for flash type communications, derived from circuits and facilities as invulnerable as possible to any interruption or damage, either natural or man-made. This emphasis has resulted in definite action toward dispersal of facilities and avoidance of probable target areas for location of such facilities. No longer can the military Services be dependent upon a single major consolidated trunk for their total needs between any two given points, because damage to this one facility would leave them without a vital component of their operational capability. Each of the Services must disperse its facilities and be in a position to assist the other Services should major disruption for any cause occur in these other Services' network. It is most important that this new trend since 1950 be recognized.

In the U. S., the military Services use leased commercial land line and microwave channels for 90% or more of their requirements for telegraph, telephone, and facsimile long line communications. However, for overseas communications, each Service generally has found it pru-

dent and necessary to establish its own radio transmitting and receiving stations and its own circuits, although frequently channels in a circuit of one Service are made available to another Service for its use. A considerable number of commercial channels are also leased to augment individual Service requirements.

This big difference stems basically from the fact that the U. S. has physical control of, and operates both ends of all domestic channels, and can take such steps as are necessary to alter their form or protect their operation from outside interferences. On the other hand, nearly all overseas circuits have the foreign terminal in the hands of the nation in which they are situated, except those of the U. S. military Services. These latter terminals are completely owned, operated and controlled by the U. S. military Services concerned, in accordance with appropriate bi-lateral military agreements, arrived at during the government negotiations of the various mutual defense pacts in which U. S. Forces and resources are involved. A second reason, although not nearly as important as the first, is that commercial circuits, built to serve the needs of commercial and civilian world-wide use, often do not go to the points where U. S. military needs exist. For instance, in the Arctic areas, substantially no commercial facilities exist, as is well known.

The Commercial Networks

Now let us look at the U. S. commercial communications systems and see how they fit into the national defense picture. First of all, as stated in previous paragraphs, the Services use leased commercial land line and microwave channels for most of their domestic channel requirements. Understandably, the American Telephone and Telegraph Co. and Western Union provide the bulk of these channels. However, the number being supplied by the independent companies is sizable and growing. The current annual rate of expenditure by the military Services for leased facilities and services is on the order of one hundred million dollars and by 1958, this rate is expected to approach one hundred and fifty million dollars. Succeeding years will go even higher, with SAGE (Semi-Automatic Ground Environment) alone *ultimately* accounting for over one hundred million dollars per year.

In order to minimize the danger of lost facilities during an emergency from any cause whatsoever, great care is exercised to take advantage of numerous alternate routings, which are available because of the great multiplicity of facilities either in existence or being built. Essential requirements are always divided between two or more different routes and in different cables or microwave links; none is being provided over any given route from a single facility exclusively. In addition, of course, the military Services maintain emergency back-up facilities to essential operational circuits, the extent of which varies directly with the importance and vulnerability of the primary circuits themselves. In the event of a major war involving atomic strikes on this country, as simulated during Operation Alert 1956, it is evident that great damage will occur to the Nation as a whole and specifically to the domestic communications networks. However, the multiple routings and the quick recovery capability of these systems, plus the emergency back-up circuits, are expected to provide at least the minimum essential channels to maintain civil life and continue active military operations.

Insofar as overseas facilities are concerned, the U. S. is blessed with very extensive services of all types and to all parts of the world—telephone, telegraph, facsimile, telephoto, and the like. Countries served by the U. S. Commercial Carriers, working with their opposite numbers on foreign soil, include substantially every one in the world. Services are especially heavy to South and Central America, to all of Europe, the Mediterranean and the Middle East, and to numerous points in the Pacific, such as Hawaii, the Philippines, Formosa, Australia, New Zealand, the East Indies, etc. These facilities consist of radio-telephone circuits, both point-to-point and ship-to-shore, similar radio-telegraph circuits and a large variety of submarine telegraph cables, soon to be augmented by a number of large capacity submarine telephone cables.

Facilities of U. S. Industry

Among the U. S. commercial companies which have international facilities that fit into the United States, NATO, SEATO, or Hemispheric defense plans are the following:

All America Cables and Radio Incorporated, serving principally Central America, South America and the West Indies by cable and radio.

The American Telephone and Telegraph Company, which has very extensive radio-telephone facilities to almost every major city across the seas, both Atlantic and Pacific, and including most ships at sea.

The Commercial Cable Company, which has extensive telegraph facilities across the Atlantic.

The Mackay Radio and Telegraph Company, which has very extensive telegraph facilities across both the Atlantic and Pacific Oceans and including Central America, South America and ships at sea.

Press Wireless, Inc., which also has extensive telegraph facilities across the Atlantic and the Pacific, into South America and to ships at sea.

The Radiomarine Corporation of America (now in process of being merged with RCA Communications, Inc.), which has very extensive telegraph and other facilities to ships at sea.

RCA Communications, Inc., which furnishes telegraph and TEX services to many major cosmopolitan areas world-wide as well as facsimile and some telephone service.

The Radio Corporation of Puerto Rico, with services principally within the West Indies and to New York.

Tropical Radio Telegraph Company, whose stations provide extensive radio-telegraph communications between the West Indies, Central and South America, and the United States; Tropical also operates overseas radiotelephone stations in the Central American area and Panama, similarly interconnected with the Americas.

Western Union Telegraph Company, which has extensive telegraph cable facilities in the Atlantic Ocean and to Central America.

This list includes the U. S. companies engaged in furnishing the majority of international telecommunications services, but does not attempt to list all of them.

Very close liaison and coordination exists between the military Services and the commercial communications carriers, as well as with the other branches of the government, such as ODM, FCC, Commerce and the State Department, in the entire area of mutual telecommunications support in an emergency. The military and civil network managements are in virtually continuous contact in regard to (a) current communications requirements, (b) mobilization requirements, (c) disaster communications requirements, and (d) commercial physical plant security requirements. Through this constant liaison the commercial companies become familiar with the military requirements and military operations; similarly the military Services become more familiar with commercial communications practices and the commercial facilities, which can in peace or in an emergency augment their own facilities to various parts of the world. The top U. S. agency under which this planning is carried out is the Office of Defense Mobilization and, more specifically, the Office of the Assistant Director for Telecommunications, ODM, where national mobilization planning in the telecommunications area is taking place. The value of this liaison and planning was very evident during Operation Alert 1956, wherein industry and government agencies operated effectively and in wholesome coordination.

One of the greatest values of the commercial communications systems in an emergency, both domestic and overseas, is providing essential communications paths for the civil side of the house. Included are the principal needs of the Government itself, other than the military, such as State, Commerce, ODM, and FCDA. In addition, there are the needs of industry in support of the mobilization effort. Finally, there is the great need of the private citizen himself, which has a great impact on the overall morale, the will to resist, and the strength to survive in case of all-out atomic attack. The survival of the Nation itself under such conditions, and its recuperative powers to carry on, depend in large measure on its ability to intercommunicate effectively and rapidly.

Communications Networks Vital for Defense

In conclusion, it can be seen that the U. S. communications networks, taken as a whole, constitute an absolutely essential part of our national defense structure. In the U. S., the channel needs of all users for defense are provided primarily from the facilities of the commercial carriers. This includes not only the major *government* users, such as the Military, Federal Civil Defense Administration, Civil Aeronautics Administration, State Department, etc., but also essential non-government users in support of industry for defense. Outside the U. S., the total needs are provided by a combination of military and commercial networks, the major users of which are the Defense Department, State Department, Commerce, and industry. It is obvious that these facilities, both domestic and overseas, are a major asset under conditions of all-out attack, because their very multiplicity and dispersion are assurance that the minimum needs for telecommunications can be met even under the most trying of conditions. National survival itself would then be at stake and would depend in large measure on them.

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High Power Output

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The FLATPAK is a rugged, precision engineered dynamotor that is designed for mobile radio and general commercial use. It is of laminated field design, and its compact size makes it ideal for applications where space is a problem. Available in ratings through 110 watts continuous duty and 300 watts intermittent duty. Output to 650 volts.

dependable power supply under severe operating conditions

the SANGAMO TYPE SF

Series "S" Dynamotors are used for both military applications—including aircraft, marine, and missile—and non-military applications where the customers write their own exacting specifications. The Type SF illustrated is ideal for small transmitters.

Models are available to 250 watts continuous and 400 watts intermittent. Input voltage 6 to 115. Output voltage up to 800.

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ROTARY CONVERTERS • SPECIAL DC MOTORS

Times Facsimile Develops High-Speed, Wide-Band Transmitter

by Charles DeVore

Above: Times Facsimile Corp. engineers check the high-speed, wide-band facsimile transmitter used to send the 10-page edition of the New York Times to San Francisco over a portion of the American Telephone and Telegraph video circuit at a rate of one page in two minutes. Left to right: P. R. Marzan, project engineer; J. R. Shonnard, field engineer in charge of the San Francisco technical operations; K. R. McConnell, supervisor of electrical engineering; P. R. Grafstein, supervisor of mechanical engineering. All these men are members of AFCEA.

"All the News That's Fit to Print"

The New York Times.

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15 or More Nations Are Said to Favor Establishing International Control

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Turning Point May Come Today—New Opposition Is Shown by Soviet

By HAROLD CALLENDER
Special to The New York Times.

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The final stage of the conference will begin tomorrow, when it will have before it a declaration circulated by Secretary of State Dulles yesterday and discussed privately today. The declaration calls for operation of the canal by an international board on which Egypt would be represented.

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Harriman Supports Protest on Form of Request to Build Power Plant

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At the same time Governor Harriman, with whom Mr. Poletti talked by telephone, said in a brief statement from Albany that he also disapproved of the application in its present form.

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4 U. S. NEWSMEN AWAITED IN CHINA FOR 30-DAY TOUR

Red Agent Reports They Will Visit Despite the Objection of State Department

By GREG MacGREGOR
Special to The New York Times

HONG KONG, Aug. 19—Representatives of four United States news-distribution agencies are planning to enter Communist China Thursday despite the State Department's refusal to approve their visit, the China Travel Bureau said today.

The manager of the bureau said he had confirmed reservations for James Robinson, of the National Broadcasting Company; John Roderick, of The Associated Press; Robert Miller, of the United Press, and Keyes Beech, of the Chicago Daily News Foreign Service.

The travel bureau spokesman said it was his understanding that employers of the four correspondents had agreed that they could proceed into China without official approval from the United States Government.

The manager of the travel bureau added that any qualified United States correspondent would be welcomed by Communist China if he was able to produce "acceptable" identification, and evidence that his employer had directed him to cross the Chinese border.

British Money to Be Used

He said the original thirty-day-tour invitation would be extended to sixty days if formal application was made to the Foreign Ministry in Peiping. He said he hoped more United States newsmen would accept the invitation, which was extended to reporters of newspapers, magazines and radio-television networks and news agencies.

The correspondents planning to enter Red China indicated that they intended to carry

The New York Times

WITHDRAWS: Millard E. Tydings, who announced his withdrawal yesterday as Maryland's Democratic candidate in the Senate race.

STEVENSON TO USE TRUMAN SERVICES

Finnegan Says Advice Will Be 'Utilized All the Way Down the Line'

By WILLIAM M. BLAIR
Special to The New York Times

LIBERTYVILLE, Ill., Aug. 19—James A. Finnegan, Adlai E. Stevenson's campaign manager, said tonight that former President Harry S. Truman would "be utilized all the way down the line" in the Democratic Presidential campaign.

"We hope to have his [Mr. Truman's] advice and counsel"

TYDINGS GIVES UP RACE TO REGAIN HIS SENATE SEAT

Maryland Democrat, Target of McCarthy in '50 Bid, Heeds Doctor's Advice

By The Associated Press.

HAVRE DE GRACE, Md., Aug. 19—Millard E. Tydings withdrew today as Maryland's Democratic candidate for the Senate. He said his health made it "impossible for me to conduct a vigorous campaign."

The 66-year-old former Senator made his withdrawal announcement in a letter to T. Barton Harrington, chairman of the Democratic State Central Committee.

Mr. Tydings was stricken with a severe case of shingles, a disease that affects the nerve ends, shortly after his nomination in the May 7 primary.

He was first confined to his home near here, then spent forty-six days in Johns Hopkins Hospital in Baltimore. He is presently recuperating at home.

There have been persistent reports that Mr. Tydings would drop out of the race. His backers and members of his family have said that he would run. But recently, the denials were coupled with the qualification that Mr. Tydings would begin campaigning "if, as expected, his health continues to improve."

Served 24 Years in Senate

Mr. Tydings had served for twenty-four years in the Senate before his defeat in 1950 by John Marshall Butler, Republican, who is running for re-election this year.

In his letter to Mr. Harrington, Mr. Tydings said his health had improved in recent weeks and he "had hoped and expected to be able to begin campaigning right after the close of the Democratic National Convention.

"However, my doctors are now

Continued on Page 4, Column 5

G.O.P. CONVENTION TO START TODAY; UNITY STRESSED

Southerners Gaining Headway on Rights

By ALLEN DRURY
Special to The New York Times.

SAN FRANCISCO, Aug. 19—The Eisenhower Administration tonight was apparently preparing to consider a modified civil rights plank that would be acceptable to Southern delegations to the 1956 convention.

The move was being engineered by members of the White House staff who have been conferring with Northern leaders of the Resolutions Committee, which is drafting the platform. The committee met most of the day, and faced many more hours of effort to complete its work.

As members left their closed-door session for a recess, it was clear that the Southerners' fight to modify the civil rights plank, hitherto making little headway, was beginning to gain ground. And

Continued on Page 4, Column 5

PROPOSED PLANK SUPPORTS ISRAEL

G.O.P.'s Tentative Platform Offers Help Against Attack But Is Silent on Arms Aid

Text of the tentative foreign

PARTY CONFIDENT

Nixon and Civil Rights Are the Only Issues Imperiling Accord

By W. H. LAWRENCE
Special to The New York Times.

SAN FRANCISCO, Aug. 19—Confident Republicans open their centennial convention tomorrow, ready to give quick renomination to President Eisenhower and Vice President Richard M. Nixon.

This is the first time in twenty-four years the G. O. P. has met as the party in power.

The major controversies that divided it so sharply four years ago are entirely absent. In fact, only two questions threatened complete harmony at the Cow Palace near here.

One issue was renomination of Vice President Nixon. This was generally assumed because the effort of Harold E. Stassen to displace him has rallied so far only a tiny minority.

Mr. Stassen, however, has continued to see a 50-50 chance that the final ticket will have Gov. Christian A. Herter of Massachusetts as the President's running mate.

The other question was civil rights, a problem that bothered the Democrats in Chicago last week. Southern Republicans have balked at a strong platform endorsement of the Supreme Court's anti-segregation decisions and have threatened a floor fight they could not possibly win.

"All the News That's Fit to Print"

The New York Times.

LATE CITY EDITION
Condensation of U. S. Weather Bureau forecast:
Mostly fair today, cooler tonight.
Mostly fair tomorrow.
Temperature range today: 88—60.
Temperature range yesterday: 87.2—75.
Full U. S. Weather Bureau Report, Page 42.

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POLICE HUNT WAY TO COMBAT GANGS; POLL 254 CITIES

Juvenile Delinquency Study Covering Nation May Bring Change in Method Here

Possible revision of New York City police procedures for combating juvenile crime hinges on findings in a survey that will be completed soon.

Capt. Frederick J. Ludwig, new commander of the Juvenile Aid Bureau, said yesterday that the department had polled 254 major cities in the United States and Canada on practices and techniques in this field.

Analysis of the answers has been going on for weeks, and it is now estimated that a composite picture can be drawn before the end of the month.

Captain Ludwig said that on the basis of analysis to date, "redeployment of personnel" in several units, including his own, seemed likely.

The survey addressed 287 specific questions to the police forces of all cities over 100,000 population and selected smaller cities. It is said to be "the most extensive survey on juvenile delinquency ever made in the United States."

Kennedy in Dual Role

Police Commissioner Stephen P. Kennedy undertook the survey in a dual capacity, since he is also chairman of the committee on juvenile delinquency of the International Association of Chiefs of Police.

Captain Ludwig, an authority in the field, said after appearing as a guest on Columbia Broadcasting System's television program "Eye on New York" that the department would not embark on "any foolish experiments."

"We're going to employ methods which have been tried, tested and proven true," he declared.

Appearing with Captain Lud-

The New York Times

WITHDRAWS: Millard E. Tydings, who announced his withdrawal yesterday as Maryland's Democratic candidate in the Senate race.

THUG IS SHOT DEAD IN PARK AVE. DUEL

Two Confederates Seized—Policeman Injured as Cafe Hold-Up Effort Is Foiled

A masked robber was killed and two of his confederates were captured in a pistol battle with the police last night after the three had attempted to hold up a midtown Park Avenue restaurant.

Police Sgt. Howard Brunn and an employe of the restaurant—the Town and Country—were injured in the exchange of

TYDINGS GIVES UP RACE TO REGAIN HIS SENATE SEAT

Maryland Democrat, Target of McCarthy in '50 Bid, Heeds Doctor's Advice

By The Associated Press.

HAVRE DE GRACE, Md., Aug. 19—Millard E. Tydings withdrew today as Maryland's Democratic candidate for the Senate. He said his health made it "impossible for me to conduct a vigorous campaign."

The 66-year-old former Senator made his withdrawal announcement in a letter to T. Barton Harrington, chairman of the Democratic State Central Committee.

Mr. Tydings was stricken with a severe case of shingles, a disease that affects the nerve ends, shortly after his nomination in the May 7 primary.

He was first confined to his home near here, then spent forty-six days in Johns Hopkins Hospital in Baltimore. He is presently recuperating at home.

There have been persistent reports that Mr. Tydings would drop out of the race. His backers and members of his family have said that he would run. But recently, the denials were coupled with the qualification that Mr. Tydings would begin campaigning "if, as expected, his health continues to improve."

Served 24 Years in Senate

Mr. Tydings had served for twenty-four years in the Senate before his defeat in 1950 by John Marshall Butler, Republican, who is running for re-election this year.

In his letter to Mr. Harrington, Mr. Tydings said his health had improved in recent weeks and he "had hoped and expected to be able to begin campaigning right after the close of the Democratic National Convention.

"However, my doctors are now

Continued on Page 5, Column 5

G.O.P. CONVENTION TO START TODAY; UNITY STRESSED

Southerners Gaining Headway on Rights

By ALLEN DRURY
Special to The New York Times.

SAN FRANCISCO, Aug. 19—The Eisenhower Administration tonight was apparently preparing to consider a modified civil rights plank that would be acceptable to Southern delegations to the 1956 convention.

The move was being engineered by members of the White House staff who have been conferring with Northern leaders of the resolutions committee, which is drafting the platform. The committee met most of the day, and was prepared to meet late into the night to complete its work.

As members left their closed-door session for a recess, it was clear that the Southerners' fight to modify the civil rights plank, hitherto making little headway, was beginning to gain ground. And

Continued on Page 5, Column 5

PROPOSED PLANK SUPPORTS ISRAEL

G.O.P.'s Tentative Platform Offers Help Against Attack But Is Silent on Arms Aid

Text of the tentative foreign

PARTY CONFIDENT

Nixon and Civil Rights Are the Only Issues Imperiling Accord

By W. H. LAWRENCE
Special to The New York Times.

SAN FRANCISCO, Aug. 19—Confident Republicans open their centennial convention tomorrow, ready to give quick renomination to President Eisenhower and Vice President Richard M. Nixon.

This is the first time in twenty-four years the G. O. P. has met as the party in power.

The major controversies that divided it so sharply four years ago are entirely absent. In fact, only two questions threatened complete harmony at the Cow Palace near here.

One issue was renomination of Vice President Nixon. This was generally assumed because the effort of Harold E. Stassen to displace him has rallied so far only a tiny minority.

Mr. Stassen, however, has continued to see a 50-50 chance that the final ticket will have Gov. Christian A. Herter of Massachusetts as the President's running mate.

The other question was civil rights, a problem that bothered the Democrats in Chicago last week. Southern Republicans have balked at a strong platform endorsement of the Supreme Court's anti-segregation decisions and have threatened a floor fight they could not pos-

Times Facsimile Displays High-Speed, Wide-Band Transmission

ALTHOUGH DELEGATES TO THE 1956 Republican National Convention in San Francisco may not have gotten any political surprises, they did have a journalistic surprise waiting for them, thanks to new electronic developments.

By six o'clock each morning, they could read a ten-page adless edition of The New York Times which included news of the meetings that had ended only a few hours earlier. That edition, edited and made up in New York at four a.m., New York time, had been transmitted in facsimile form over a 3,000-mile video circuit of the American Telephone and Telegraph's Long Lines Department, printed in San Francisco, and then delivered to their hotels.

Previous Transmission

A high-speed, wide-band facsimile transmitter was the chief electronic development that made this achievement in journalism possible. Capable of sending a full-sized newspaper page coast to coast in two minutes, this transmitter was developed by the Times Facsimile Corporation under the direction of Austin G. Cooley, director of engineering.

Facsimile transmission of a newspaper is not news in itself. Eleven years ago, The New York Times published an edition for delegates to the first Assembly of the United Nations, which also met in San Francisco. But that edition had only four pages, and it took forty minutes to transmit each page from New York over the existing Associated Press wirephoto facilities—twenty times longer than with the new high-speed equipment.

The Journey West

In addition to being faster than the equipment used in 1945, the new facsimile transmitter also has four times greater fidelity than the old machine. Credit for these gains goes to the combination of the wider band width of the transmission channel—nearly 500,000 cycles—and a high-intensity facsimile recorder lamp, which flickers on and off at the rate of 60,000 pulses a second. It was developed for this experimental operation by Sylvania Electric Products, Inc.

Work on this project was started in the summer of 1955 by a dozen top engineers of A.T.&T.'s Long Lines Department and Times Facsimile. A series of tests were made in March of 1956. In June, complete newspaper pages were being sent twice the distance required. Both the transmitter and the receiver stood side-by-side in the Times Facsimile plant. Copy, however, made the full journey to the West Coast and back.

The facsimile edition distributed on the West Coast was the regular International Edition of The Times. As each page was set in type in the composing rooms in New York between 2:30 and 4:00 a.m., book-stock proofs were pulled and rushed uptown to the Times Facsimile plant. Book stock was used because it is less inclined to smear than coated stock.

A sending drum, with a surface area twice the size of a newspaper page, awaited the proofs. Two full-size pages were wrapped around the drum. A photoelectric cell in the transmitter scanned the pages at the rate of 120,000 segments a second, each segment measuring 1/200 of an inch square. The resulting signal was carried by coaxial cable to the Long Lines Center in New York and then over the microwave relay system to San Francisco.

John Shonnard, a Facsimile engineer, was at the receiving end of the system in San Francisco. There, a receiver with a rotating drum, like the sending drum in New York, was connected to the telephone company's long lines office. There were also two telephone circuits, one for local calls, the other a "talk" circuit to Facsimile in New York, which was kept open during the transmission.

Recording the Image

The image sent from New York was recorded on a photographic film cut to newspaper size and wrapped around the receiver drum. As each page was finished, Mr. Shonnard dropped the film into an oversize developing tank alongside the receiver. The resultant negatives were then rushed by motorcycle to an engraving shop where zinc plates were made. The zinc engravings were then sent to a printer and matrices made from the engravings converted into curved plates for printing on regula

(*Continued on page* 64)

Technical Data on High-Speed, Wide-Band Times Facsimile Equipment

Receiving and sending drums: Diameter, 8 in.; length, 32; speed, 1500 rpm
Direct drive synchronous motor, running on 1500 cycles from local tuning fork at each station
Scanning speed: 200 lines per inch
Words per minute: 10,500 (smallest type used)
Keying frequency: 60 kc.
Carrier frequency: 430 kc.
Recorder lamp: High-pressure Sylvania crater lamp, similar to R1130-B
Automatic start of recorder
Phasing: Stroboscopic light and advance or retard of receiving drum speed by 6 rpm until phased

RUGGED, LONG LIFE EIMAC 4X5000A CERAMIC TETRODE DELIVERS 10kw FOR SINGLE SIDEBAND

4X5000A RADIAL-BEAM POWER TETRODE TYPICAL OPERATION FREQUENCIES BELOW 30 mc.	Class C CW	Class AB R-F Linear Amplifier
D-C Plate Voltage	7500 v	7500 v
D-C Screen Voltage	500 v	1250 v
D-C Grid Voltage	-350 v	-300 v
D-C Plate Current	2.8 amps	1.9 amps
Driving Power	150 w	0 w
Plate Dissipation	5 kw	4.2 kw
Plate Power Output	16 kw	10 kw

Class AB figures shown are under Peak Envelope or Modulation Crest Conditions.

Top Single Sideband performance plus the advantages of great immunity to damage by thermal or physical shock are combined in the metal and ceramic Eimac 4X5000A radial-beam power tetrode.

Developed especially for Single Sideband communication systems the 4X5000A delivers 10kw power output and has a maximum plate dissipation rating of 6000 watts. High output is easily developed without going into the positive grid region.

A unique integral-finned anode permits the 4X5000A to be cooled with low air pressures. Simple coaxial construction provides low inductance multiple terminals.

Now available for optimum socketing and cooling of the 4X5000A is the Eimac SK300 air-system socket.

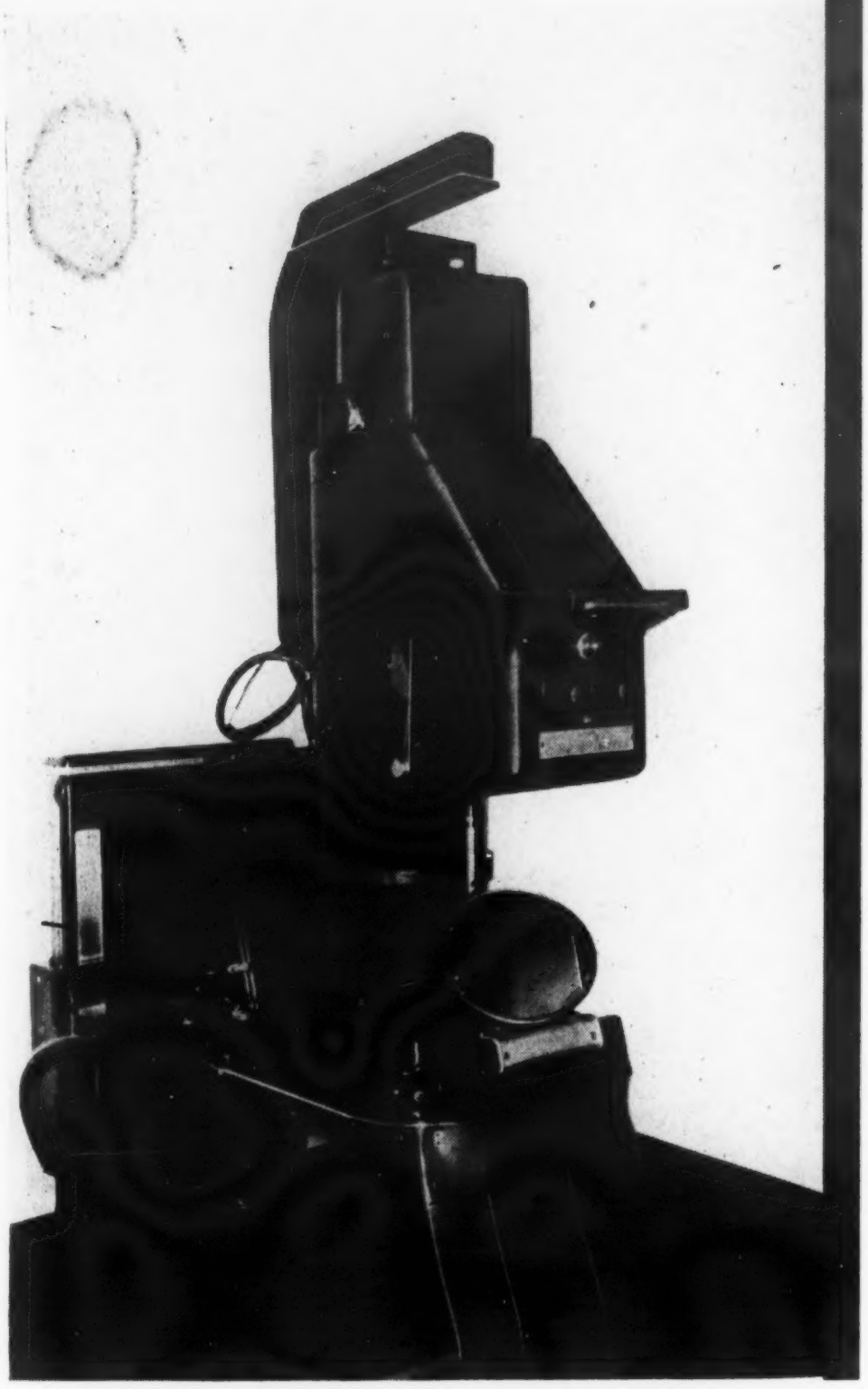
For further information about the 4X5000A and its companion socket write our Application Engineering Department.

Eimac

EITEL-McCULLOUGH, INC.

SAN BRUNO CALIFORNIA

The World's Largest Manufacturer of Transmitting Tubes



Pictured at the left is the Cine-Fluorex System of Roentgenography, manufactured by Westinghouse.

new horizons in photographic engineering

by Frank Smith, Photo Editor of SIGNAL

PHOTOGRAPHIC ENGINEERING IS NEVER STATIC AND THE search for newer, better, and more economical systems and processes is a never-ending one. This, in turn, creates new horizons which lead far afield from the old concepts of photographic engineering. Indicative of these new horizons, this paper will summarize some current and recent developments in this domain such as cineroentgenography, evaparography, electrophotography, light amplification, and video recording. An analysis of these developments clearly indicates the trend away from conventional silver halide processes and the impact of electronics on photographic engineering in general.

In recapitulating recent and current research and development in the domain of photographic engineering, it is apparent at once that there is underway a broad movement towards newer and broader horizons in this rapidly growing field. These newer horizons consist mainly of developments concerned with getting away from conventional silver halide systems and their attendant darkroom and processing problems by means of electrophotography and its variations; the development and improvement of image amplification; the coupling of image amplification systems and television; infrared imaging on non-silver halide surfaces, and the radio frequency production of light. With the single exception of infrared imaging on non-silver halide surfaces (evaporography), all these systems depend upon the principles of electrostatics and electronics.

This means one thing—that the field of photographic engineering is being invaded by electronics. With the newer improvements that will surely come, it is not unreasonable to believe that in time silver halide systems, except for amateur and some other uses, will be almost, if not entirely, outmoded. As prophetic of this, one has only to go back to the Daguerreotype system invented in 1839 which flourished for some 12 to 15 years, only to be succeeded by the system now in use.

Some Prominent Developments

An indication of the impact of electronics on photographic engineering and probable trends may be gained by a study of the brief summaries given below of a few of the most prominent developments in this field.

A system of Cinefluorography using an image intensifier tube, which will open up new vistas in medical instruction and diagnosis, has been placed on a commercial basis by Westinghouse Electric Corp., Pittsburgh, Pa. Known as the Cine-Fluorex, the new system will provide an additional valuable tool for the radiologist and industrial radiographer. Heretofore, X-Ray pictures

of moving parts have been considerably hampered by the inability to obtain a satisfactory brightness level. By using image intensification, it is now possible to make motion pictures which, until recently, were considered impractical.

The main components of the system are:

(1) Image intensifier tube for intensifying the brightness of the fluoroscopic image. (2) Optical device for viewing the intensified image and also transmitting the same image simultaneously to the Cine Camera. (3) Cine Camera. (4) Cine Control.

The camera consists of a 16mm film magazine, a synchronous motor drive, gears for changing the film speed, and commutators for synchronizing and pulsing the X-Ray machine. The camera is designed for two film speeds: 15 and 30 frames per second.

For use in industry, X-ray motion pictures will "slow up" motion of rapidly moving internal structures, permitting detailed study of dynamic components. A completed mechanical assembly shrouded in metal is easily studied in motion for weak points. Motion pictures of moving aircraft parts can be retained as a permanent inspection report for possible future use.

A revolutionary new camera for taking pictures in the dark by means of infrared radiation is now available. Known commercially as "the Evaporograph," ("Eva," for short), Model JZ1, the new camera, is a development of Baird Associates, Inc., Cambridge 38, Mass.

Principle of Operation

Principle of operation of the camera is that radiation emitted from an object is focused as an image onto an oil film on a micro-thin membrane. The oil then evaporates away from point to point at rates varying with the amount of radiation received at each point. Seen in reflected light, these differences in oil film thickness appear as different colors, like oil films on water. The detailed thermal picture of the field of view can be viewed directly, or a photographic record can be made with conventional photographic apparatus incorporated in the device.

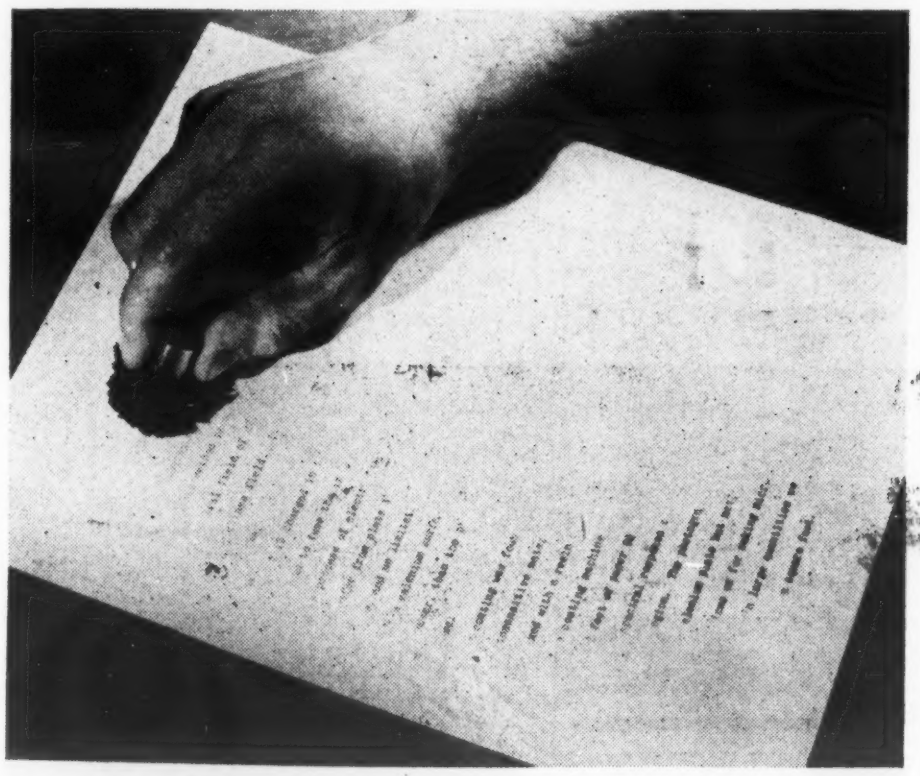
The normal oiled membrane appears yellow (the base color) when seen through the viewer. As oil condenses on the membrane, building up in thickness, the color changes to red, then blue, and black to yellow (second order). This color cycle repeats during further condensation and reverses during evaporation. The density of a series of membrane photographs taken during this cycle also varies, cycling in the same manner.

The radiation from the field of view can then be measured in two ways—visually and photographically—by comparing the rate of thickness change in terms of color or density to the rate of radiation from a body of known temperature and emissivity. The results can be converted to temperatures by use of radiation temperature tables based on the Stephan-Boltzmann Law.

The camera is equipped with an f/2.25 lens, 8 feet focal length, 5-degree angle of field. The focusing range is 6 feet to infinity and resolution 10 to 14 lines/mm at 10 degrees C difference for high emissivity material.

The camera is the result of development of a basic discovery made by Czerny, a German physicist, in 1933, and is expected to prove of great value as a research tool in medicine and industry.

Shown above is a new electronic device that amplifies light up to 40,000 times and literally sees in the dark. In commercial production at Bendix Aviation Corp., the system is called the Lumicon, and is described as "a major scientific break through providing for the first time an electronic apparatus even more sensitive to light than the human eye." The Lumicon consists of a detector unit or orthicon image tube linked to a monitor or picture tube through a closed television circuit. The photograph here is a picture of a picture on a TV screen where the only illumination in the whole room in which the subject sat was the glow from her cigarette!



A magnetic "brush" applies pigmented resin powder to bring out the image on a sheet of photosensitive paper developed by scientists of Radio Corporation of America for a new, simplified dry photographic process known as Electrofax. The paper, coated with a thin layer of special zinc oxide with a resin binder, is subjected to an electrostatic charge which gives it a photosensitivity as great as that of standard photographic contact printing papers. The charge is reduced in areas exposed to light leaving a latent image which is brought out, as shown by application of pigmented resin powder mixed with iron filings on a permanent magnet. The developed image is made light-fast and permanent by baking the sheet for a few seconds. The entire process, even when carried out by hand, takes only a fraction of a minute.

AIR TO AIR • AIR TO GROUND • GROUND TO AIR • GROUND TO GROUND

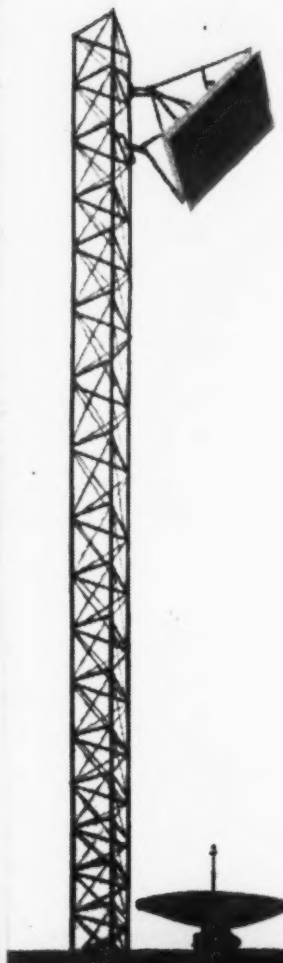
This is BIRD

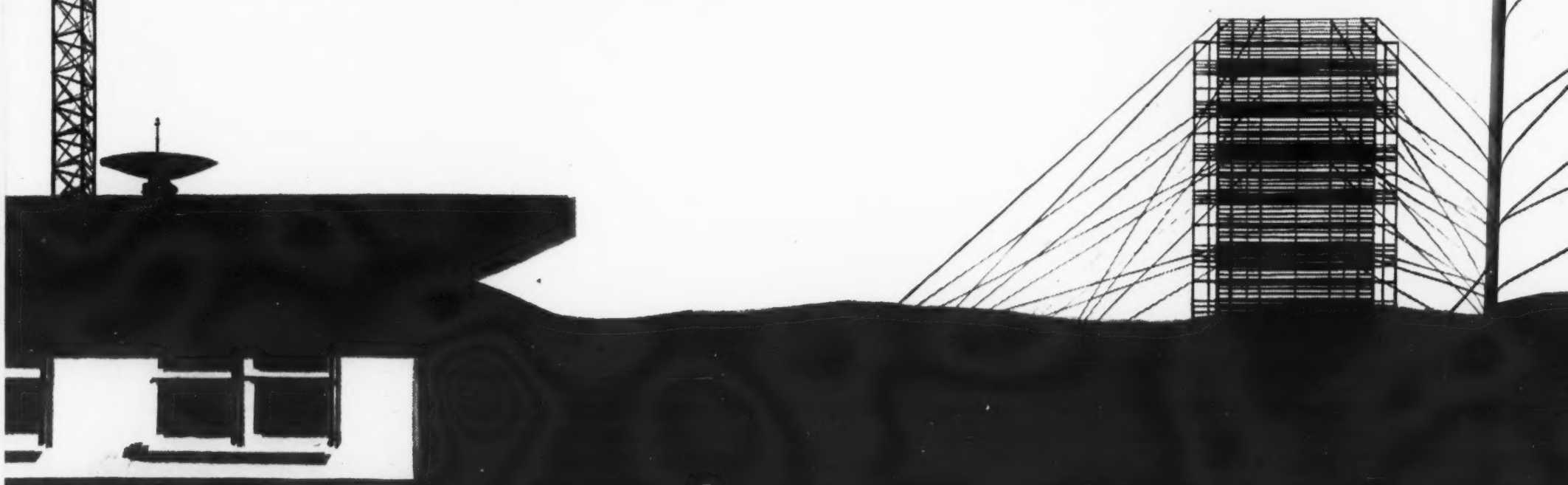
Single Sideband employed in new Air Force project to improv ng

Birdcall is the nickname of the U.S. Air Force's new project to advance greatly the effectiveness of intercontinental communication. The System will handle the increased traffic now dictated by national defense, and employs single sideband as the primary technique to improve the quality and reliability of the long range (HF) signal.

Collins Radio Company, pioneer of SSB, is providing the entire research, manufacturing and installation on a systems engineering basis for ARDC's Rome Air Development Center.

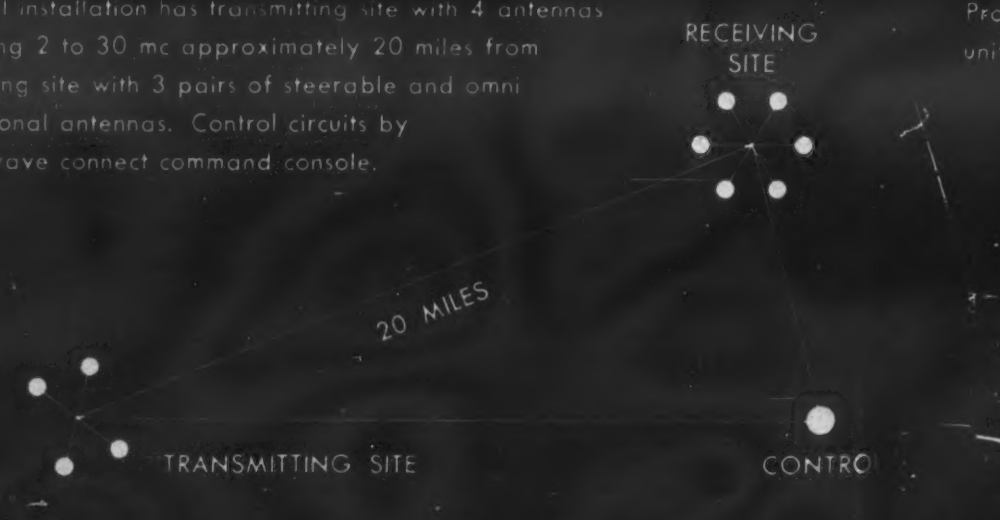
Collins is integrating existing equipment with new Collins designs, both airborne and ground, of all radio, remote control and antenna facilities — three types of which are illustrated here — to assure the highest possible performance.





Transmitting and receiving facilities are the most advanced in the art, many of which represent over 10 years of intensive development in SSB.

Typical installation has transmitting site with 4 antennas covering 2 to 30 mc approximately 20 miles from receiving site with 3 pairs of steerable and omni directional antennas. Control circuits by microwave connect command console.



DCALL

roving range communication

Project also includes transportable transmitting and receiving ground units to facilitate field performance.

RO

Collins

COLLINS

Pictured at the left: Electronics research has a new tool in the Evaporograph manufactured by Baird Associates Inc., Cambridge, Mass. The unit, recently declassified by the Signal Corps, is shown here in use to measure heat variations in an electronic chassis. EVA can observe radiation differences corresponding to temperature variations of one to several thousand degrees F. This device operates somewhat like a camera. Radiation emitted from an object is focused as an image onto an oil film. The oil then evaporates away from point to point at rates varying with the amount of radiation received at each point. Seen in reflected light, these differences in oil film thickness appear as different colors, like oil films on water. The detailed thermal picture of the field of view can be viewed directly or a photographic record can be made with a camera incorporated in the apparatus.

For those interested in unconventional photography, the Electrofax electrophotographic process recently developed by the RCA Laboratories, Princeton, N. J., holds much promise as a unique photographic method which does not use silver, hypo, or fixer with their attendant darkroom procedures. The process is entirely dry and operates on the electrostatic charging principle.

In practice, a sheet of ordinary paper, humidified until the moisture content exceeds a certain percent, is covered with a pigmented photo-conductive resin. To make the paper light-sensitive, it is electrically charged by passing it over a small wire grid carrying an extremely high voltage, but low current, immediately prior to exposure. After exposure the image is developed by sprinkling another pigmented resin on the surface, and fixed by briefly heating at around 150 degrees Centigrade. The Electrofax process is resistant to radiation fogging and is approximately 50% as costly as conventional photographic films, and the equipment required for development is only 10% as expensive. It is planned to supply the papers in a wide range of speeds to suit exposure requirements. An application of the process which appears to possess wide uses in the photographic arts is that it provides a swift new method of preparing offset and photo engraving printing plates involving a single photographic operation which is claimed to be many times faster than the conventional methods now used.

Process Applications

The process makes possible the production of a complete lithographic plate in less than a minute and reduces to a few minutes the time required to prepare a printing plate for etching. The process may also be applied to the fast production of printed circuits and will produce images or printed characters on any paper, wood, metal, plastic, or other surface coated with an inexpensive photo-conductive pigment. For the first time, the process permits direct projection of an image onto the plate that is to be used in actual printing.

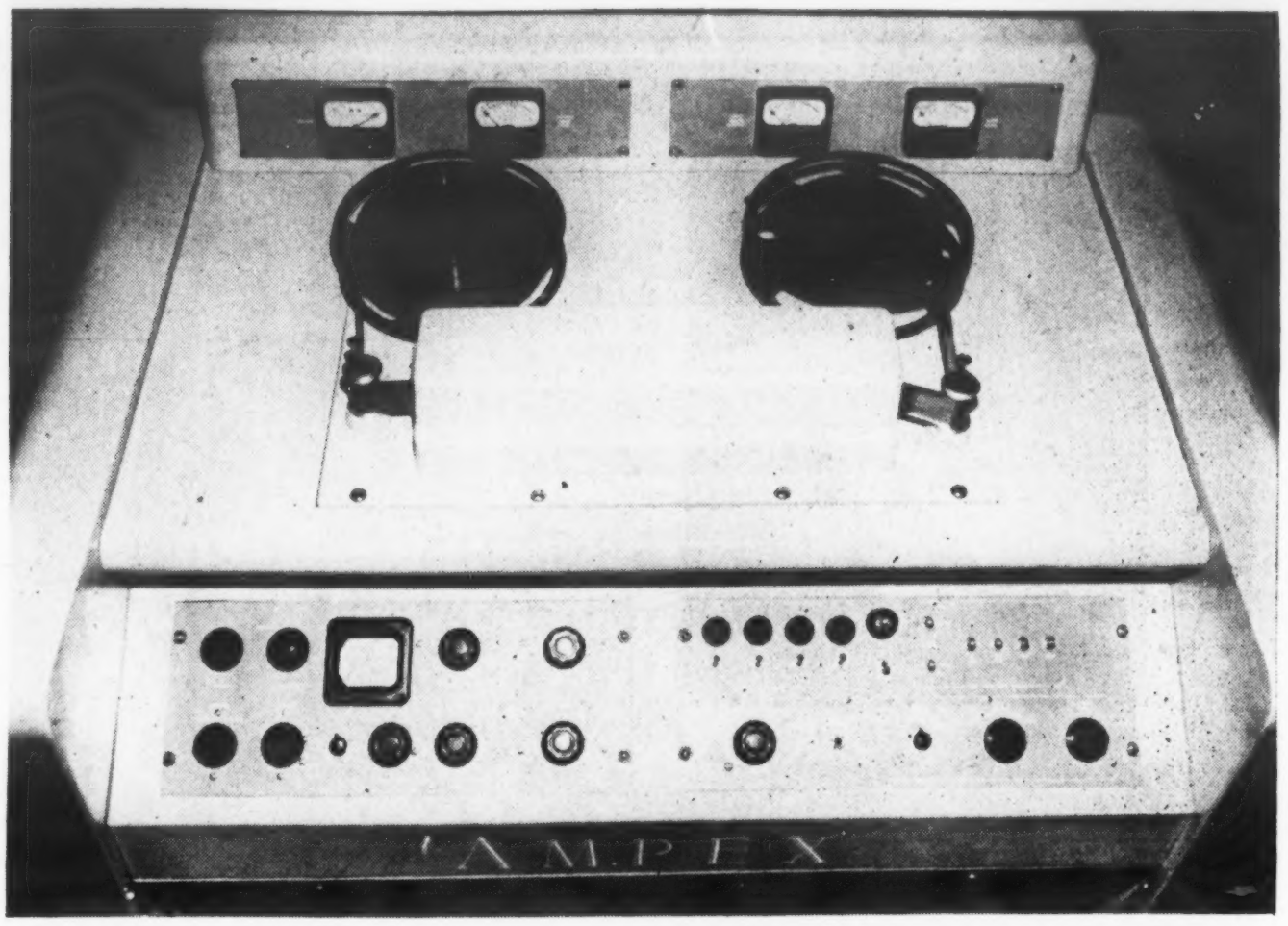
One of the latest devices that is claimed to amplify light electronically as much as 50,000 times is the Lumicon, recently developed by the Friez Instrument Division of the Bendix Aviation Corp., Baltimore, Md.

The device consists essentially of what is commonly called a closed television link system; that is, a TV camera or detector coupled directly to a monitor or viewing unit which may be remotely removed from the detector unit. Since the device is primarily a light amplifier, it may be used with any type of radiation which may be converted to visible light.

Contrasted with ordinary TV systems which use 525 lines for each separate picture, the Lumicon uses 1029 lines per picture in order to get better resolution. The repetition rate, however, is the same as TV; that is, 30 separate pictures per second. This permits moving objects to be adequately visualized. The detector unit consists of a standard TV pick-up tube together with an appropriate fast optical lens of great light gathering power. These fast lenses, together with newly developed special circuits, provide a unit which will operate at extremely low light levels. The unit, which may be linked with X-Ray, includes a TV pick-up tube and associated circuits, together with a light hood, incorporating a mirror and a fluorescent screen to convert the incident X-Rays into visible light. The TV pick-up tube sees light only. For this reason, the Lumicon is really a light intensifier, and can be used with almost any form of light or radiation which can be converted into light.

Another field of application of the Lumicon might include, for example, its use as a watchman whereby large tracts of land or warehouses, railroad yards, bridges, etc., can be under constant surveillance, using several detectors all connected to a central observation station. Other promising applications of the instrument include photography, TV, industrial radiography, and many processes requiring the ability to "see" at extremely low light levels.

One of the newest and perhaps most unusual developments to make its appearance recently is the Video Tape Recorder of The Ampex Corp., Redwood City, Cal. Desig-



Pictured at the left is a top view of the Ampex Corporation's recently developed magnetic tape recorder for television programs. The unit will record both pictures and sound for a full hour's program on a reel of magnetic tape two inches wide and 14 inches in diameter. Despite the number of controls, recordings are made by pushing only one button.

nated as the Ampex VTR Magnetic Tape Recorder for television programs, the unit will record both pictures and sound for a full hour's program on a reel of magnetic tape two inches wide and 14 inches in diameter. Picture quality is claimed to be considerably better than that obtained with current kinescope techniques using photographic film. Programs can be recorded directly from the TV camera, TV receiver, TV transmission lines, or from microwave relay systems and can be immediately replayed with no processing of any kind necessary. The recorded picture signal may be erased when it is no longer needed and the tape re-used to record another program. This is in contrast to photographic film which cannot be re-used after it has once been exposed.

The Ampex Recorder

The Ampex machine operates on the same basic principles as employed in a regular audio tape recorder. Electrical signals are passed through a coil around an electromagnet known as the recording head. The strength of the magnetic field in the recording head at any time depends on the electrical current in the coil at the given instant. In turn, the magnetic field impresses a pattern on the magnetic surface of the tape as it passes the recording head. The pattern on the tape, therefore, corresponds to the electrical signals in the coil on the recording head. Since the electrical signals are generated by the TV camera, the pattern on the tape corresponds to what the camera "sees" at any given instant. To reproduce the pictures, the tape is passed across the same magnetic head. The magnetic pattern on the tape induces a current in the coil around the head. Since the pattern corresponds to the original picture, the induced current can be fed to the TV transmitter just as though it were coming directly from the TV camera.

Ampex engineers have developed a system which permits a tape speed of only 15 inches per second. To achieve this relatively low tape speed, a magnetic head assembly which rotates at a high speed is used, giving an effective tape speed sufficient to record and reproduce the full 4-megacycle band width. Thus, while the tape moves slowly, the heads move across the surface of the tape at a very high speed. The head assembly actually consists of four heads placed on a rotating drum. One head is always in contact with the surface of the tape. As one head leaves the tape, the next head makes contact. The magnetic pattern is recorded transversely across the tape instead of longitudinally, as in conventional audio recorders.

Resolution of the recorder is more than 320 lines as contrasted with the maximum number of lines which a station can transmit, which is 340. The average receiver has a horizontal resolution of approximately 275 lines across the face of the picture tube.

A summary of recent developments in the field of photographic engineering discloses several developments which are at once unique and unusual. Among these may be mentioned the Video Tape Recorder of Ampex, the Electrofax process of RCA, the Evaporograph of Baird Associates, and the Lumicon Light Amplifier of Bendix. These developments serve more than anything else to pinpoint the present status and the new horizons of photographic engineering and to indicate future trends of this rapidly growing and progressive science which touches upon and draws from practically every other science.

Impact of Electronics

These trends indicate clearly the impact of electronics. With the single exception of the Evaporograph which is non-electronic, all these systems and processes utilize electronics in one way or another to achieve results that are unheard of in conventional silver halide photographic systems. That these trends and developments will continue to widen on every front is to be expected, and that electronics will play a leading part, if not the leading part, is a prediction one may safely make if current developments are any criteria of the future.

E. H. RIETZKE, President, CREI
Capitol Radio Engineering Institute

• *One of a series of institutional messages.*

THE PRIVILEGES OF LEADERSHIP

WE HAVE all heard about the "Penalties of Leadership." At CREI we look at it another way. We like to emphasize the *PRIVILEGES* OF LEADERSHIP. The privilege of being among the leaders in technical institute education offers us the finest challege any institution can face—the constant challenge to do *our* best to make our *best* even better.

On June 1, 1956 CREI started its 30th year as an educational institution. Twenty-nine years earlier CREI had been organized with an idea, an ideal, $250 in tangible assets, a very small part of its courses actually in print, and no student body.

The idea has developed at a constantly accelerating pace. We have never deviated from the ideal of providing the *very best* in technical electronic education for *professional* electronics personnel, regardless of cost and effort. We have operated on sound business principles and have plowed the major portion of earnings back into the operation, so that today the tangible assets, including the CREI buildings recently appraised at more than $300,000, are now in the seven figure bracket. The active student body today numbers more than 10,000 professional electronics engineers and technicians, all over the world and in every phase of electronics, both military and civilian.

Over the years CREI has pioneered (or helped pioneer) several important firsts in technical institute education—

a. 1927. The first *advanced* course in Practical Radio Engineering. The scope of this course, previously available only to high rated naval personnel, has constantly expanded with the technical developments and growth of the electronics industry.

b. AUGUST, 1941. The first private pilot course for radio mechanics for the U. S. Army Signal Corps. During World War II CREI in its residence school, trained approximately 5,000 radio technicians for the U. S. Army and the U. S. Coast Guard.

c. 1943. CREI supplied more than 300,000 texts to the U. S. Navy in a special course for radio technicians in the South Pacific.

d. DURING WORLD WAR II CREI was the first private school of less than four year degree level to participate in the ESMWT program of the U. S. Office of Education. Operating under contract with the University of Maryland, CREI trained 3,000 men and women for war industry.

e. 1943. CREI was a founder-member of the National Council of Technical Schools, the organization which first established scholastic and business standards for that essential area of technical education. Mr. Rietzke was the first President of that organization, serving four terms in that capacity.

f. 1944. CREI offered the first large scale program of individual-progress residence instruction ever offered by any institution of higher learning. Now, twelve years later, we consider this to be one of the most important and successful contributions we have ever made in this area of technical education.

g. 1945. CREI was one of the first three Technical Institutes to have its curricula accredited by the Engineers' Council for Professional Development. Mr. E. H. Rietzke, CREI President, served on the original ECPD Technical Institute Sub-Committee and for 10 years represented the private Technical Institutes of the United States on that Committee.

As we enter our 30th year, CREI has in effective operation, group training programs with organizations representing the cream of the electronics industry. Leading companies regularly visit CREI to select graduating students for the better-than-average technical jobs.

Yes, it is a privilege to be among the leaders in a great and essential field of endeavor. We pledge ourselves to ever increasing effort so that we may continue to warrant the confidence of the great industry which, by the increasing use of our product, has placed a seal of approval on our institution.

CAPITOL RADIO ENGINEERING INSTITUTE

ECPD Accredited Technical Institute Curricula

Dept. 2111-C, 3224 Sixteenth St., N.W., Wash. 10, D.C.

Quotes in Review

a survey of major statements made during the past two months

"In considering the United States reactor development program, two factors should be kept in mind. The first is our long-range objective of economically competitive nuclear power in this country. This goal is difficult to achieve, because we have adequate supplies of relatively cheap fuel as well as large, efficient, and economical, conventional generating plants. In developing economic nuclear power we must, therefore, seek levels of efficiency beyond those which would suffice in most other areas of the world.

"The second consideration is that we have no reason to believe that any single type of reactor system will satisfy the variety of our needs. As a consequence, we are investigating many technical approaches to nuclear power. While this variety of approaches is partially attributable to the fact that we do not yet know which reactor concepts are the best, many other and equally important factors have influenced our program. For example, among these are: The need for nuclear power plants in a wide range of generating capacities; the need for a balance between burners, converters, and breeders; the possibility that natural uranium reactors may prove more desirable than enriched reactors in some instances, and preferences as to reactor types which may be dictated by geographical locations.

"Our power reactor program can be considered as going through three development phases which follow one another in logical sequence. The first is exploratory, dealing with basic research and development in such fields as metallurgy, physics, chemistry, and heat transfer. The second phase is the reactor experiment. In this phase, a relatively small reactor is built and operated to prove the technical feasibility of a concept. Information is gained concerning such items as reactor and systems stability, control characteristics, actual corrosion rates, and mechanical component behavior. The third phase is the prototype phase. In this stage of development, large-scale reactors are built primarily for the purpose of demonstrating the economics of a certain system. While the prototype may not be economical itself, it *will* point the way toward improvements which will, in turn, lead to truly economical power. In addition, the prototype will give experience in the operation of a nuclear power plant which must meet certain commitments as to delivery of power on demand.

* * *

"The Commission has assumed the responsibility of providing the basic technology for power reactor development. This work is complicated and costly, and the results are often uncertain. The design and construction of the prototype or demonstration reactors is another matter. Here the emphasis is on economics and reduction of costs. We know of no better way to achieve this end than to bring to bear normal business incentives. Hence, we have encouraged both the reactor designers and builders, and the utility companies to accept the primary responsibility in the construction of these prototype reactors. We have insisted on limited and well defined amounts of assistance by the AEC. This is not because we wish to reduce our cost, but because we believe this leads to real progress on cost reductions. There is increasing evidence of a desire on the part of industry to move into the field of nuclear research and development. We have encouraged such participation in the development of new reactor concepts which industrial groups may have originated, and in as wide a variety of feasible approaches as possible."

W. Kenneth Davis
Director, Division of Reactor Development
U. S. Atomic Energy Commission
International Bank Forum
Washington, D. C.

"The need to avoid over-standardization of consumer products in the future era of automation may bring about a broad revival of the small workshop in which individual artisans will again practice crafts or skills that have lost their relative economic importance during the past few generations.

* * *

"A plant which automatically consumes raw materials and disgorges thousands of cigarette lighters, or automobiles, or television sets, all of identical appearance, may be an inspiring sight to anyone looking for technical efficiency, but it is bound to be disheartening to the consumer with a basic desire for individual preferences in style, color, size and shape.

* * *

"Future electronic designs, responding automatically to instructions in the manner of today's computers and data-processing systems may vary the operation of machines in the later stages of the production line according to a predetermined schedule, causing the finished products to emerge in a number of different exterior designs built around identical interior assemblies. This represents an automatic method for achieving at least as much variety as we now have in such mass-production items as automobiles and television sets.

"It is doubtful that the relatively limited variety that

can be achieved in this way will entirely suffice in an era when the average consumer will have a higher income, more leisure, and perhaps a broader educational and cultural background than he does today. Even now, custom-built or hand-made products are sold at a premium, largely because they satisfy a basic desire for individuality. In the future era of automation, this tendency is likely to become more pronounced.

"Under these circumstances, it is entirely possible that the advent of widespread automation will bring not only large automatic factories, but a broad revival of the small workshop in which individual artisans will again practise crafts or skills that have lost their relative economic importance during the past few generations in our industrialized society.

* * *

"It is hard to imagine any automatic process which can economically or even technically match human skill in the production of highly individualized items of wood, wrought iron, glass, tapestry, or any other multitude of decorative goods and materials in wide demand even today. With the rise in living standards and the probable growth of variety in consumer tastes in the environment of automation, there will not only be a greater demand for these fine individual products, but a population which is still better able to afford them.

"The question of achieving sufficient variety with automatic production thus may resolve itself in a complete reversal of the trend toward greater standardization during the past 50 to 75 years, restoring the skilled artisan to the position which he held in earlier society. Considered in this light, automation promises not only a major revolution in our technology and our economy, but a more productive society in every sense."

Dr. Douglas H. Ewing
Vice President, RCA Laboratories
The Instrument Society
New York, N. Y.

"The CAA is in the midst of an accelerated three-year program to modernize its airways with radar and other new devices, so that we will be ready to integrate the new jets into our airway pattern along with the slower aircraft. From the standpoint of traffic control, there are no problems which are radically new. The jets merely will fly faster, fly higher, and have different fuel reserve problems. But given the right kind of equipment, there is nothing superhuman about the task of controlling them along their routes, and, with some modification of basic techniques, in the terminal areas.

* * *

"There has been some concern about operating jet engines in the vicinity of terminal buildings. Present indications are that if the jets are operated with reasonable care, they can turn and taxi with little more effect on persons nearby than is produced by present-day propeller blast, with the one exception of the noise factor (particularly the high-pitched turbine whine) with present-day engines in the vicinity of terminal buildings. Present in- not beyond hope, however. In any event, the jets are not the fire-breathing dragons that some persons have imagined.

* * *

"The problem of aircraft noise, as everyone knows, is partly a matter of human psychology, and whenever human beings enter the picture, it is difficult to forecast just what their reactions will be. The noise of the jet is entirely different from that of the piston engine. Will it be more objectionable to people on the ground than the vibrating roar of the piston engine? Or will it, as we hope, prove more acceptable and tolerable to the average person than today's aircraft noise? The answer is not yet clear.

"In any event, none of the problems and difficulties I have mentioned is going to stop aviation dead in its tracks. You can be confident that the young giant we call aviation is going to keep right on growing. And no matter whether the powerplants are piston, jet, or rocket, the airport will be the beginning and the end of every flight, the key to the most important form of transportation that man has yet devised."

James T. Pyle
Acting Administrator, CAA
Jet Age Conference
Spokane, Wash.

"Can the effects of nuclear radiation be used to improve the characteristics and operation of electronic materials and components? What is the relation between a material that will withstand high temperature and one that will withstand high radiation energy? Finally, what is the effect of radiation on magnetic and structural materials? There are, of course, numerous other questions.

* * *

"In order to get the required answers, it was necessary to plan and devise a comprehensive testing program for electronic materials and components. In planning this program, it was decided to combine all the environments that electronic equipment would operate under for test purposes rather than use the single environment of nuclear radiation. Thus, it was possible to consider humidity, temperature, shock and vibration, and other factors in conjunction with nuclear radiation.

* * *

"Past experience has shown that nearly all materials show some degree of change, from mild to severe, when exposed to nuclear radiation. Such effects may be more indirect than direct, as in the case when the material exposed becomes brittle and cannot be exposed to shock and vibration. This opens up the possibility of taking advantage of the change due to radiation and design components, circuits, and equipment which will operate more effectively and efficiently when exposed to nuclear radiation. Phenomena can possibly be discovered which will alleviate our problems and instead of fighting radiation effects, it may be possible to utilize them to our advantage."

Colonel William Donics, USAF
Assistant Chief, Communications & Electronics Division
AFCEA Chicago Chapter
Chicago, Ill.

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AIRBORNE TELEVISION . . . IN VERTICAL DESCENT

by 2nd Lt. Howard A. Jorgensen

Army Pictorial Center

ARMY TELEVISION RECENTLY CAME down to earth . . . literally! As a part of the Army's plan to investigate the military potential of television, an airborne test was conducted at Ft. Benning, Georgia, under the supervision of the Television Division of the Army Pictorial Center. The purpose of the investigation was to ascertain the practical aspects of a live telecast while suspended from a parachute and to transmit scenes of a massed battalion drop from the air during vertical descent. Through this experiment, important data was obtained that may serve to extend the scope of battle area surveillance techniques and establish the feasibility of televising intelligence data to ground support units in combat.

Preparations for the Test

Preparations for the test were begun early this year at the Army Pictorial Center in Long Island City, New York. Under the supervision of Lt. Colonel Norman Gray, Chief of Television Division at the Center, plans for the investigation were initiated. Captain Kenneth Elk, Motion Picture Coordinating Officer of the Army Motion Picture Depository, was assigned to spearhead the testing.

The equipment used was the new Signal Corps portable television system consisting of a 47-pound backpack transmitter and a small handheld camera weighing 8 pounds. The new equipment had been ground tested with good results. Operating on coaxial cable, transmission was clear up to 1,000 feet from a control point. Utilizing the transmitter's radio frequency capabilities, clear pictures could be obtained up to one-half mile or more. However, the transmitting characteristics were not known for air-to-ground transmission, though it was believed from the outset that range could be increased.

More of a challenge than the transmission factor, however, was the ungainly rectangular design of the transmitter assembly. Its sensitive components precluded the possibility of jumping the unit unprotected. Its unmodified steel casing and metallic outlets constituted an actual hazard to the parachutist. Obviously, the case had to be padded . . . both for its own protection, and that of the operator.

In considering the methods to be used in padding the equipment, another factor had to be taken into account—the placement of the load. In normal ground operations, the transmitter is worn on the back of the cameraman, and the camera is held in either or both hands. Airborne safety regulations prohibited altering the harness position of either the main parachute — worn on the back — or the reserve assembly, which is worn over the chest. The only position remaining, therefore, was in suspension from "D" rings directly below the reserve pack. Due to the fact that the camera and transmitter are joined by a coaxial cable which could not effectively be separated in the sky, it was obvious that an additional compartment would have to be built into the main pack. In the planning stage, it was estimated that the composite case for camera and transmitter would weigh roughly 15 pounds. This would bring the anticipated load up to 70 pounds. Inasmuch as airborne safety regulations prohibit riding such a weight to the ground, Captain Elk and testing personnel resorted to the standard GP bag procedure which involves cutting the entire assembly loose at 150 feet above ground and letting the equipment descend at the end of a 15 foot control line.

In designing the carrying case, it was decided to make liberal use of commercial foam rubber as a shock absorbing medium. A two-inch layer of sponge rubber was therefore fitted around the entire transmitter unit, while the base section was reinforced with a total of four inches of sponge rubber to absorb the initial landing impact. The inner foam jacket was in turn covered with heavy canvas and reinforced with an "H" harness to afford maximum support. Upon completion of the carrying case, it was discovered that the total weight of the bag when empty exceeded the initial estimate by 16 pounds. It scaled 31 pounds! When loaded with the transmitter and camera, the entire assembly weighed 86 pounds and measured 30 by 19 by 12 inches.

Test Jumps Conducted

Although the gross weight of the container proved heavier than anticipated, the actual cubic bulk and wind buffer liability were of more concern to those engaged in the project. The specific problem lay in the slipstream hazard — a factor of vital concern to any parachutist jumping with a comparable load. In order to check this factor, a plywood dummy transmitter was constructed and filled with sand to the required weight — 86 pounds — and the assembly readied for test jumping. The site for the first test was set at Ft. Benning, Georgia. A 34-foot training tower was used, and in the latter part of April, sufficient tests were made to assure Captain Elk that the container was practical.

Testing from a 34-foot tower was adequate to test the practicality of the container, but the real test had

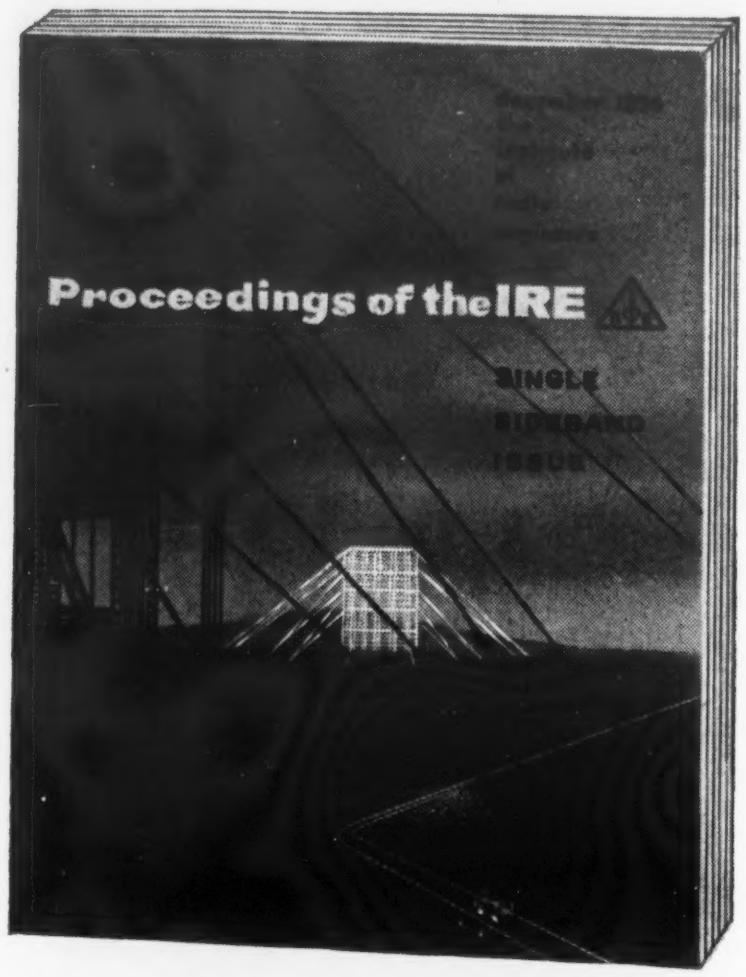
IRE reports on SINGLE SIDEBAND!

The December issue of **Proceedings of the IRE** presents a round-up of the most recent technical discoveries as presented by the Joint Technical Advisory Committee through its sub committee on single sideband techniques.

Because single sideband offers advantages over conventional AM systems for police radios, taxi radios, ship to shore radios, as well as in many other practical uses, the JTAC has launched a special study for the FCC on this new development in radio communication. Interest in single sideband systems is high because they:

1. **Reduce the size and weight of equipment, allow effective communication when conditions limit the size of the installation.**
2. **Conserve the radio spectrum by not taking up as wide a band of frequencies as do AM signals.**
3. **Permit a reduction in the total radiated power required to accomplish a given communication function.**

The December issue of **Proceedings of the IRE** begins with a guest Editorial by the Honorable George C. McConnaughey,



Chairman of the Federal Communications Commission and will take its place in the record of radio-electronics growth. IRE gave you the color TV issues of October, 1951, and January, 1954, the scatter propagation issue of October, 1955, the earth satellite issue of June, 1956, and now December's special single sideband issue—a reference work of the decade!

Get the December Proceedings of the IRE and get the facts about SINGLE SIDEBANDS

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"Frequency Control Techniques for Single Sideband" by R. L. Craiglow, E. I. Martin, Collins Radio Co., Cedar Rapids, Iowa

"A Suggestion for Spectrum Conservation" by R. T. Cox, E. W. Pappenfus, Collins Radio Co., Cedar Rapids, Iowa

"Power and Economics of Single Sideband Equipment" by E. W. Pappenfus, Collins Radio Co., Cedar Rapids, Iowa

"Automatic Tuning Techniques for Single Sideband Equipment" by V. R. DeLong, Collins Radio Co., Cedar Rapids, Iowa

"Linear Power Amplifier Design" by W. B. Bruene, Collins Radio Co., Cedar Rapids, Iowa

"Distortion Reducing Means for Single Sideband Transmitters" by W. B. Bruene, Collins Radio Co., Cedar Rapids, Iowa

"Linearity Testing Techniques for Sideband Equipment" by P. J. Icenbice, H. E. Fellhauer, Collins Radio Co., Cedar Rapids, Iowa

"Early History of Single Sideband Transmission" by A. A. Oswald, (retired) formerly Bell Telephone Labs., Inc., Murray Hill, N. J.

"Comparison of Linear Single Sideband Transmitters with Envelope Elimination and Restoration Single Sideband Transmitters" by L. R. Kahn, Kahn Research Labs., Freeport, L. I., N. Y.

"Application of Single Sideband Technique to Frequency Shift Telegraphy" by C. Buff, Mackay Radio & Telegraph Co., Inc., Brentwood, L. I., N. Y.

"A Third Method of Generation and Detection of Single Sideband Signals" by D. K. Weaver, Stanford Research Institute, Stanford, Calif.

"An Introduction to Single Sideband Communications" by J. F. Honey, Stanford Research Institute, Stanford, Calif.

"Synchronous Communications" by J. P. Costas, General Electric Co., Syracuse, N. Y.

"Synthesizer Stabilized Single Sideband System" by B. Fisk, C. I. Spencer, Naval Research Lab., Washington, D. C.

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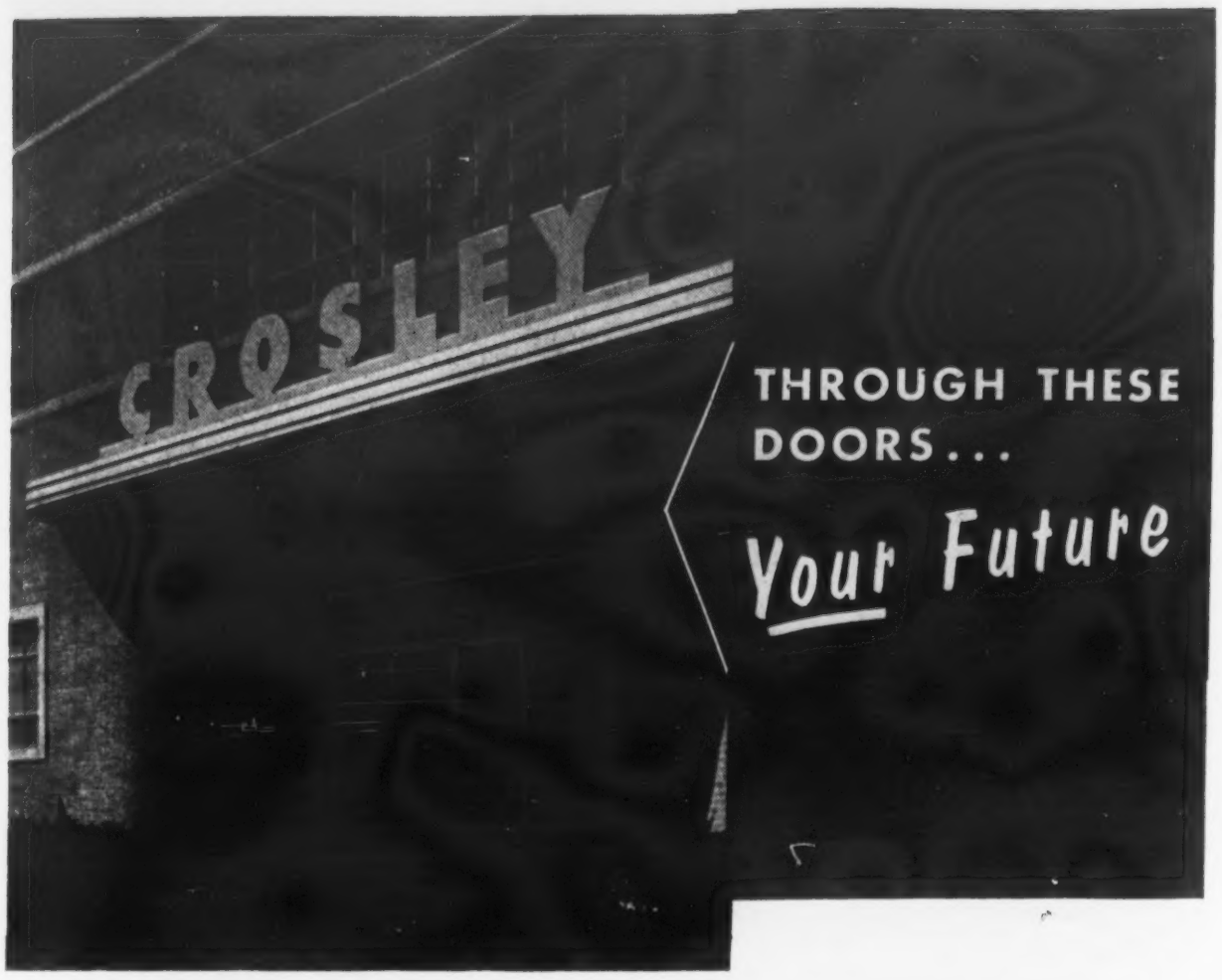

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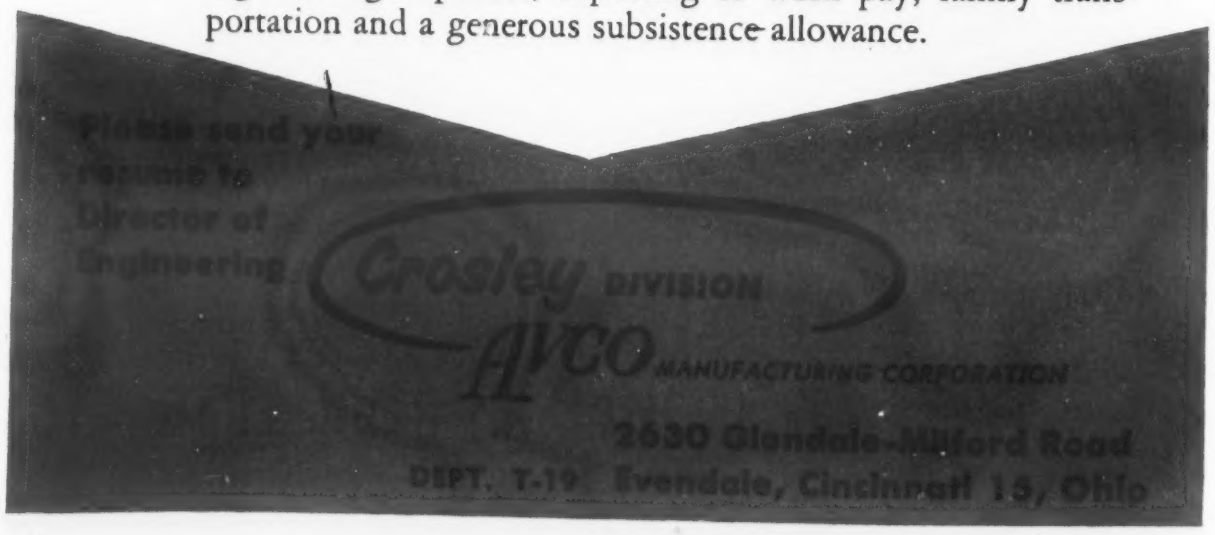

to be made during an actual jump On April 25, 1956, Captain Elk aboard a C-119 aircraft, approached the Fryar Field drop zone at approximately 1,250 feet altitude. Official observers assigned by the Ft. Benning Airborne Department were on hand, both in the aircraft and near the drop zone. Slow motion film cameras were set up in the C-119 to aircraft. The jump was made — and a second jump.

Difficulties Encountered

For the third test jump of the series, the sand-filled dummy transmitter was replaced with its electronic counterpart, along with the television camera which was placed in its boot position on the assembly. Conditions on this occasion were nearly identical to those of the previous two test jumps: exit altitude, 1,250 feet; airspeed, 120 miles per hour. Through experimentation during the first two test jumps, Captain Elk decided upon a procedure that would not only comply with airborne safety regulations, but give him maximum time in the air for actual telecasting. His procedure was to (1) keep the camera in its holster while leaving the aircraft; (2) bring the camera into operation immediately after the opening shock; and (3) replace the camera in its holster after completing transmission and *before* cutting the container assembly loose prior to landing. It was found that by following this procedure, roughly 70 seconds would be available to transmit to the ground receiver.

Due to the lack of ground monitor personnel and a weak battery pack, no attempt was made to effect live transmission on descent. The sole purpose for the third test jump was to ascertain the effectiveness of the padded container and establish whether the camera and transmitter would stand up under initial opening shock and landing impact. Examination of the camera and transmitter assembly immediately after landing revealed that both units had sustained the test. No dents, broken tubes, or abrasions could be found anywhere in the assembly, and a live transmission test conducted shortly thereafter verified the fact that the entire unit had survived the drop intact.

Upon completion of the test jumps, the assembly underwent several

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The facts of death from cancer are all too familiar. Too many have known the tragedy of losing a family member... a friend... a fellow worker. Too few know the facts of life about cancer. Yet they are there for the asking... or the seeing... or the listening. The American Cancer Society teaches life-saving facts about cancer every day of the year. Through films... pamphlets... exhibits... window displays... via radio... television... newspapers... magazines... from lecturers... information centers... you can learn vital facts that might one day mean the difference between life and death.

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American Cancer Society

minor modifications. The presence of a protruding antenna on the transmitter imposed some limitation on the jumper's door position, so the antenna was repositioned from the erect position to a down-and-outward position. The leather boot which housed the camera upon leaving the aircraft and just before landing proved to be unsatisfactory. It was difficult for the jumper to replace the camera into the holster because of the soft, naturally pliable nature of the material. A stainless steel holster was constructed for the camera, and its regular pistol grip was replaced by a shorter stock to facilitate easier manipulation in the air. A modification to the camera was previously made by attaching a metallic lens guard and dial shield to prevent accidental maladjustment during descent.

Modifications Completed

Modifications completed, transmission tests were begun on May 9. The first test was made with the equipment remaining in the C-119 aircraft as it circled the Drop Zone. The airborne antenna was fixed to the canvas container assembly, but beamed towards the ground monitor truck from the open aircraft door. A clear video image was registered on the ground monitor with a radius of up to one and one-half miles. This was conclusive evidence that the portable man-pack transmitter would operate on air-to-ground transmission. Through checking and rechecking during simulated passes over the Drop Zone, it was ascertained that a relatively clear video image could be picked up by the ground monitor at distances of up to approximately 7,000 yards.

On May 12, 1956, the first successful audio-visual telecast from a parachute in vertical descent was accomplished. Captain Elk jumped as part of a massed drop with the 504th Parachute Infantry Regiment, 3rd Battalion, during a live rehearsal for the NBC "Wide Wide World" television program. As on dry runs, the video transmitter was switched on approximately 5 miles short of the Drop Zone and shortly thereafter began registering an image on the ground monitor, even though the antenna was inside the aircraft and exceeded previously determined transmission ranges. Exit from the aircraft was made at 1,250 feet, at a distance from the monitoring receiver of approximately 900 yards. One "stick" or group of 20 parachutists were in the aircraft with Captain Elk. He alone was to jump from the right rear door — the door facing the ground monitoring unit. The "stick" made their normal exit from the opposite door.

Captain Elk described his feelings during the jump like this: "Upon receiving my opening shock, I discovered the camera had slipped out of its boot and was swinging in circles below me at the end of its cable. After a few unsuccessful attempts, I caught it with my right foot and brought it within reach. I then proceeded to aim the camera at various groups of paratroopers around me in the air and describe the scenes being transmitted by talking into a small microphone fixed below the video-finder. At about 150 feet above the ground, I gave the predetermined audio signal that I was about to cease transmission, and replaced the camera in its holster. I reached down with both hands to release the assembly. As I pulled down on the two releasing mechanisms, only one activated, and the bag swung precariously to one side. With some effort, I managed to release the other catch, and the bag dropped away. When the bag reached the end of the control rope, which was secured to my harness, it gave me a tremendous jolt. The bag hit the ground first, taking the weight off me, and I made a normal landing."

A Spectacular Shot

In the monitoring truck, the Army television director had little idea of what happened to Captain Elk in mid-air. However, since the image on the monitor gave a clear picture of what the camera was taking — the ground and other parachutes below Captain Elk — the director switched the picture onto the air for a spectacular mid-air television shot. Captain Elk's description through the PRC-6 mounted in the assembly was clearly audible during his entire descent, and served to enhance the feeling that viewers received of actually floating down in a parachute. Checking the equipment upon landing, it was found to be in good condition and completely operative. A modification to the camera holster was made in the form of a retaining strap which could be easily unsnapped in descent and the camera removed.

The Final Jump

The final jump of the series came at approximately 1520 hours on May 13, 1956. The jump was to be aired nation-wide over the actual NBC "Wide Wide World" presentation. Because of a time factor involved, it was necessary to move Captain Elk to the next-to-last serial in the formation of C-119 aircraft. This made his exit altitude 1,500 feet, giving more possible air time and a flexibility that did not exist at the 1,250 level.

Transmission conditions on the occasion proved ideal, and the ground monitors began receiving a dim image as the aircraft began the approach run about three miles short of the Drop Zone. Unfortunately, however, the air was unusually bumpy, and Captain Elk left the aircraft with a noticeably poor door position. Captain Elk explains:

> "My opening shock, as a result of my poor door position, proved severe. This apparently exerted excessive pressure on my reserve pack, which, in turn, must have pushed the 'off/on' transmission switch to the 'off' position. When I extracted the camera and brought it up to commence transmission, I found a sharp focus image in the viewfinder. Assuming the entire unit was functioning properly, I proceeded to frame on various groups of airborne chutists around me and described the sensations I felt while descending. Not until I had landed and checked the transmitter, did I notice the transmission switch had moved from the 'on' to the 'off' position."

The monitor in the control truck registered no image from the transmitter during descent. Audio, however, was received for approximately 76 seconds. It was noted that the video signal had ceased as the sixth troop carrier serial started to drop its personnel. Captain Elk had jumped from the wing plane of the sixth serial!

After gathering the facts, it became apparent that the opening shock of the parachute had cut the video signal before it had registered a

(*Continued on page 62*)

PIONEERING SCIENTIFIC FRONTIERS AT GENERAL MILLS

This scientific pioneer is Dr. G. K. Wehner, designer of the space chamber which he uses here to determine the "sputtering" or disintegration rate of molybdenum under bombardment from atoms moving at 25,000 m.p.h., 200 miles above the earth.

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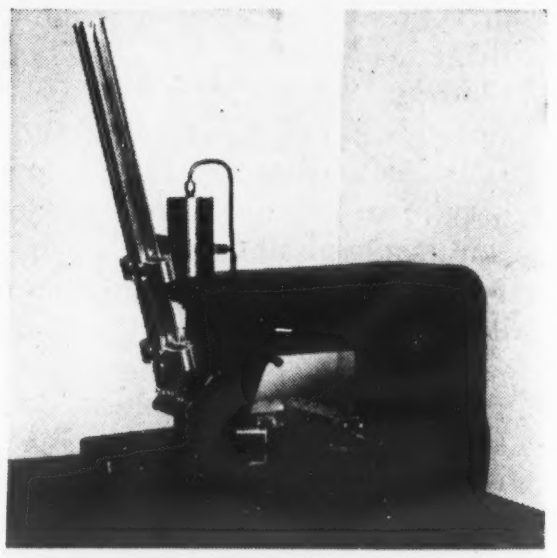

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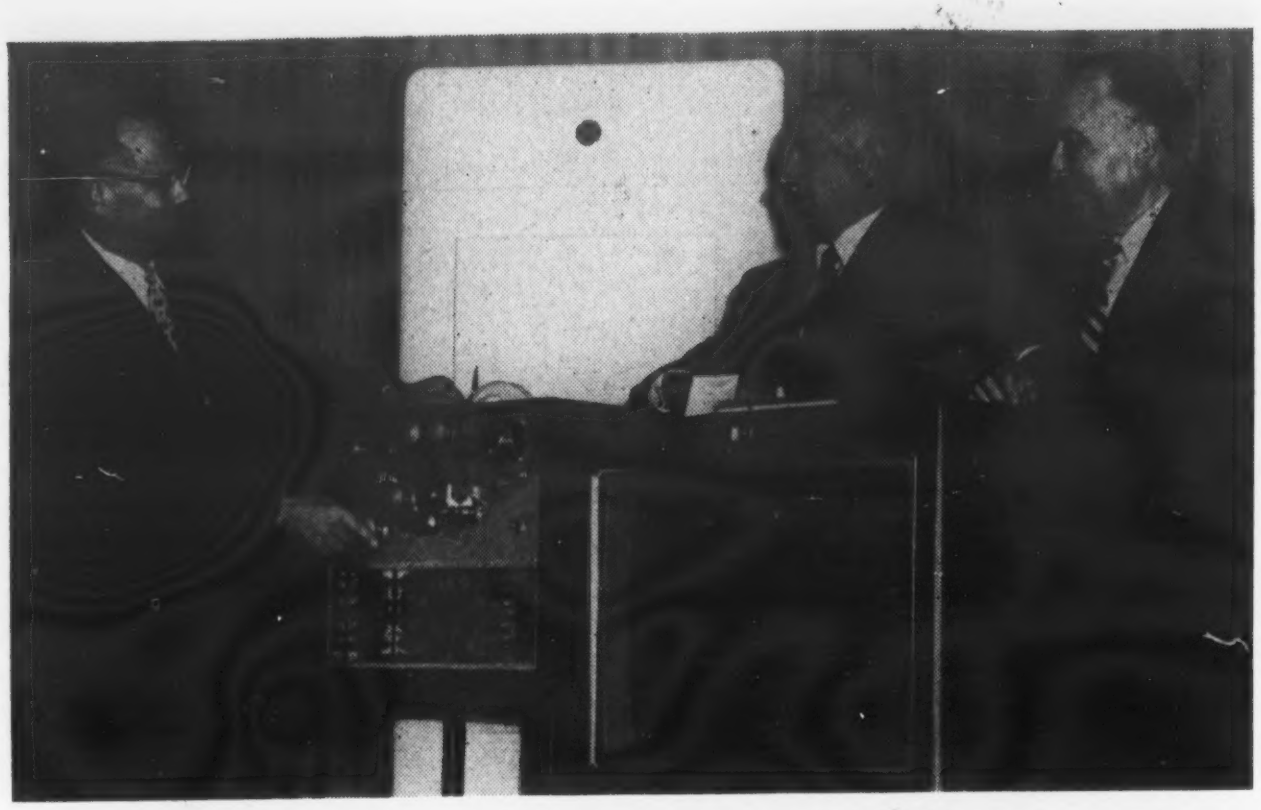


Shown above is Brig. Gen. David Sarnoff, Chairman of the Board of RCA, discussing the new RCA home magnetic tape player for television with Dr. E. W. Engstrom and Dr. Harry F. Olson. In the background is the electronic refrigerator.

A Golden Anniversary

"THE GOLDEN ANNIVERSARY, marking your fifty years in the field of radio, television, and electronics, is made brilliant by your leadership and great contributions in the science, art, and industry of communications. You have established an outstanding record of service to the American people and to the Nation. You have helped greatly to bulwark the preeminence of the United States in electronics and world-wide communications."

These complimentary words, addressed by President Eisenhower to Brigadier General David Sarnoff, Chairman of the Board of the Radio Corporation of America, on the occasion celebrating his fiftieth anniversary in radio, undoubtedly reflect the sentiments of all those who are in any way associated with the fields of radio, communications, television, or electronics.

Speaking at the Golden Anniversary Dinner on September 30, 1956, which commemorated his career of remarkable achievements, General Sarnoff ventured to make several predictions of the world of twenty years hence, which covered all phases of human existence.

Regarding communications, General Sarnoff made the following predictions: "Television, in full colors, will be completely global, so that man will be able not only to speak and hear all around this planet, but to see the entire world in natural colors. Individuals will be able to hold private two-way conversations and see each other as they talk, regardless of the distances separating them. Moreover, the beginnings will have been made in the automatic and instantaneous translation of languages, enabling people to understand one another at once across the barriers of Babel."

General Sarnoff also spoke of the future use of electronic light: "Electroluminescence, or 'cold light,' now emerging from the research laboratories, will bring into being startling, new types of illumination. It will change the appearance of our factories, streets, stores, highways, and homes. Providing light without heat and almost without shadow, its flow will be subject to easy control for volume and color nuances to suit any taste or decor. Being light without glare, it will eliminate many of the perils of night driving and flying. It will also give us brighter and bigger TV pictures, and ultimately replace the TV tube altogether with a thin, flat-surface screen that will be hung like a picture on the wall."

He declared that guided missiles will transport mail and other freight over vast distances, even over oceans. Adding that nuclear energy would be brought to "a practical state of peacetime usefulness," he stated that the American citizen of the future would enjoy the luxury of low-cost atomic fuel, and that transportation via jet-propelled and rocket-type vehicles would be provided by commercial air lines, so that "the world's leading cities will be only hours apart, many of them virtually within commuting distance."

On October 1st, General Sarnoff was presented with three "gifts" representing major electronic developments by RCA.

The first of the new devices was a noiseless, electronic air conditioning system, comprised of large wall panels which become cold under the influence of direct electric current. With a reversal of the electric current, the same panels produce a heating effect.

Another electronic innovation unveiled was the new electronic refrigerator, which operates on principles identical to those of the electronic air conditioning system.

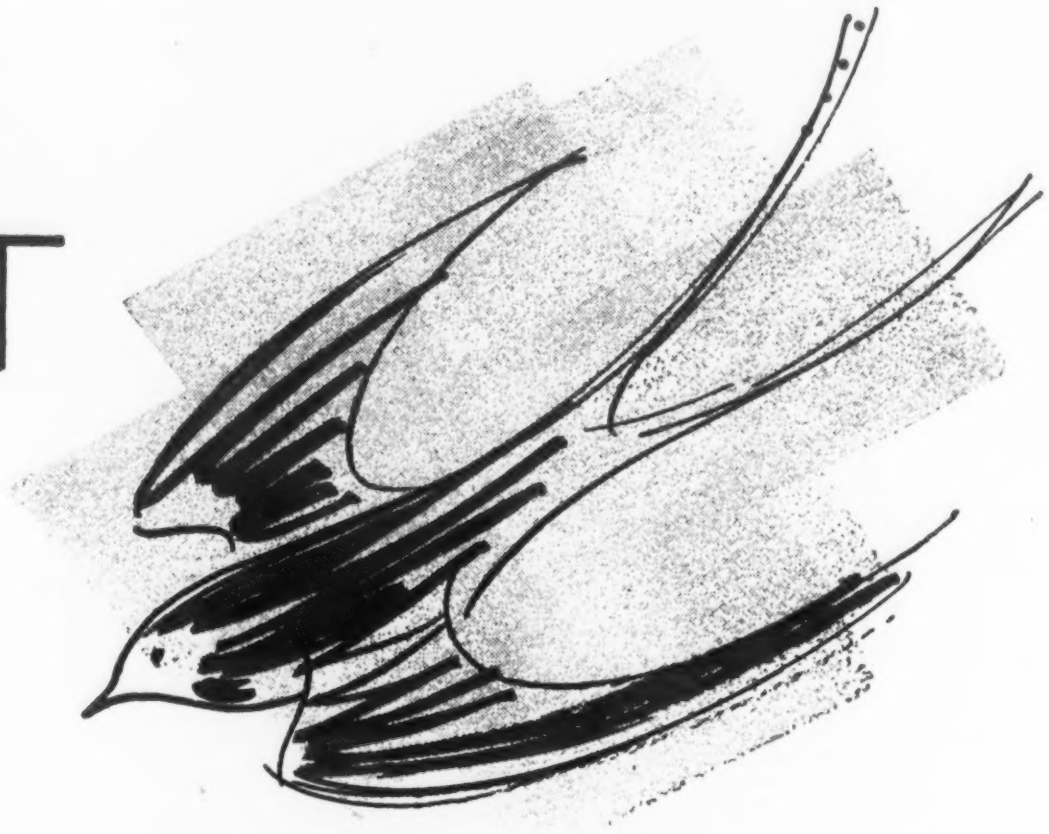
A third gift was the "hear-see" home magnetic tape player for television, which can play over a standard television set the pictures and sound of television selections pre-recorded on magnetic tape. The player reproduces on the TV set black and white TV selections, equivalent in running time to phonograph records, from tape only ¼-inch wide.

As Dr. Elmer W. Engstrom, Senior executive vice president of RCA, aptly stated, "It is most fitting that these evidences of truly remarkable progress in electronics should be disclosed at this time — on the fiftieth anniversary of one whose faith in electronic science has been unlimited, and whose encouragement of research has been responsible for so many outstanding achievements in radio, television, and electronics."

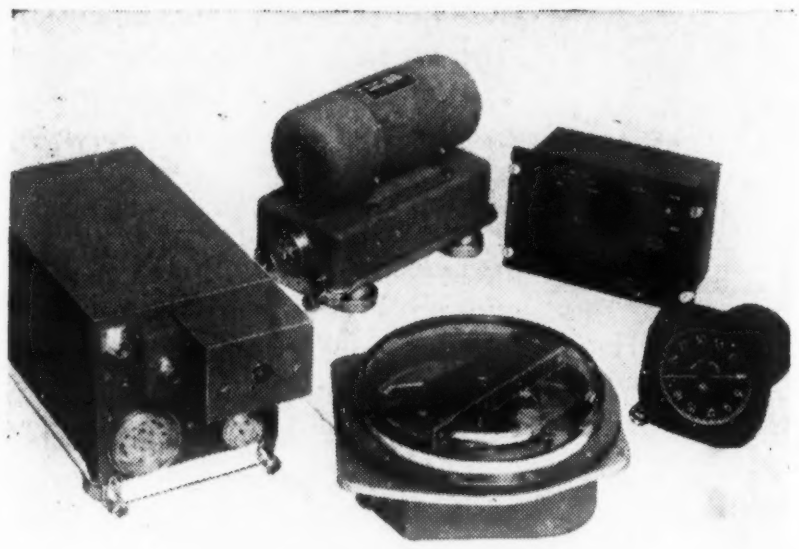
Pictured below is General Sarnoff with the noiseless and draftless electronic panel-type air conditioning system.

follow the swallow . . . . . .

FLY LIGHT



ARC's new ADF weighs less than 20 lbs!



TYPE 21 ADF WEIGHS ONLY 19.7 POUNDS

Component Units Weights: Receiver, 6.8 lbs.; Loop, 4.3 lbs.; Loop Housing, 0.5 lbs.; Control Unit, 1.6 lbs.; Indicator, 1.3 lbs.; Power Unit, 5.2 lbs.

CAA Type Certificated

Birds have nature's navigation instruments and can return unerringly to their nests from a continent away. They follow special flyways as you follow a chosen course.

But you can out-navigate the birds with ARC's miniaturized ADF. Here, after two years of testing, is an Automatic Direction Finder of great reliability—in a system whose combined parts weigh less than 20 pounds. It requires less power, too—only 2.8 amps at 27.5 volts. It has hermetic sealing of vital parts, including the entire loop, and other mechanical design features to insure ARC-dependability under today's exacting requirements. Now a dual installation, where required, will save 80 or more pounds and make room for other much-needed equipment or more payload.

The ADF is still the Number One worldwide navigational aid, usable on an estimated 60,000 radio stations. ARC's Type 21 is tunable to all frequencies from 190 kc to 1750 kc.

An outstanding feature is extremely low drag of the loop housing, which extends only two inches into the airstream.

Here is reliability you can trust—in a small package . . . high performance to ARC standards, trusted for 28 years. Ask your dealer for descriptive literature.

Omni/ILS Receivers • Course Directors • UHF and VHF Receivers and Transmitters
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Dependable Airborne Electronic Equipment Since 1928

Aircraft Radio Corporation BOONTON, NEW JERSEY

Through electronic SIGHTS to the most urgent targets of our time...

The most important objectives of the world today are not those of war, but of peace.

That is why all should rejoice at the urgency of electronic explorations into the unseen and unknown. Science and industry around the world are probing the basic structures of nature . . . seeing beyond the range of human vision. They are discovering how to create new benefits, new riches, through materials and methods within reach. War has become an obsolete tool for the gaining of wealth.

The new microscopic and telescopic "sights" that are reaching these universal targets are largely based on the cathode-ray tube made commercially practical by Dr. Allen B. Du Mont. So closely have the Du Mont Laboratories joined precision to vision that the Du Mont cathode-ray oscillograph is the U. S. standard. Du Mont leadership in new developments of dependable cathode-ray tubes and electronic control systems is recognized around the world.

Du Mont vision in electronic engineering is available for new industrial progress . . . with the same precision that has always been "on target" for industry, science, home electronics and national defense.

ENGINEERS—The Allen B. Du Mont Laboratories offer an atmosphere of achievement for successful careers. Our employment manager at Clifton or Los Angeles welcomes inquiries.

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Allen B. Du Mont Laboratories, Inc., Executive Offices, 750 Bloomfield Avenue, Clifton, N. J.
West Coast Office: 11800 West Olympic Blvd., Los Angeles 64, Calif.

Airborne Television

(*Continued from page* 58)

steady image on the monitor. A simple modification, in effect a guard for the transmission switch, could be made.

Despite the fact that the final jump was not successful, it was felt by those concerned in the test that a portable television unit of the type used can be successfully jumped from troop carrier aircraft with negligible danger to either operator or equipment. Key to the safety of both lies in the padded container. This serves the dual purpose of protecting delicate electronic components, while at the same time safeguarding the airborne operator from body injuries.

Future Testing

Captain Elk has emphasized, however, that in view of the unusual weight and size of the combined load, it is important that the jumping of the portable television unit be restricted to expert parachutists who can be relied on to perform a series of unrelated functions systematically during descent. He specifically recommended initially that only those individuals with Senior or Master parachutist ratings would be allowed to jump with the equipment.

Further testing of the portable television system is now underway. Extensive ground tests are showing that this new piece of equipment will provide considerable aid to the commander in the field by relaying important information, intelligence, and vital data to a command point. Likewise, further air-to-ground tests are planned to include transmission during vertical descent. With the knowledge gained through past tests that the equipment can remain operative after being jumped via parachute, commanders will be able to expand their intelligence capabilities by actual observation of the troops in action.

This new means of communication, portable man-pack television, may well prove to be a vital link in the commander's communication system—both on the ground and in the air. Investigations of television's capabilities, such as that of Airborne Television—In Vertical Descent, are helping to strengthen those vital links in the Army's Communication System.

THE DEFENSE JOB: A W. E. site selector on the DEW Line.

THE TELEPHONE JOB: A Western Electric central office installer.

Serving the Nation on Two Fronts

Today Western Electric people are going full speed ahead with defense work entrusted to us by Uncle Sam. They're producing special communications equipment and, among other projects, seeing through to completion the DEW Line of radar stations across the northern rim of the continent. At the same time they're hard at work making telephones and central office equipment to help meet the country's need for more telephone service.

The skills and experience acquired in telephony are, in large measure, the same which enable us to answer the call to serve the defense effort.

Western Electric

MANUFACTURING AND SUPPLY UNIT OF THE BELL SYSTEM

Planning Against Wartime Catastrophes

(*Continued from page* 12)

and safety are each highly specialized, we have broken these activities apart and, in addition to a security director, also have a safety director. It is the job of the safety director to provide manpower and facilities to minimize danger and hazards in peacetime and to provide additional manpower trained and ready for emergency use.

During development of the Mallory disaster plan, our plant dispensaries have literally become junior hospitals and are fully equipped and staffed to handle all types of emergency cases. Adequate stocks of medical supplies are maintained so that during an emergency our dispensaries wold be self-contained and would not have to draw upon regular local sources of supplies.

First-aid equipment and medicine are not confined to the dispensaries, but are dispersed at many locations throughout our various plants. Teams of first-aid crews have been trained to work with and to augment our security officers and dispensary personnel. Our people have been thoroughly trained and alerted as to what to do in time of emergency. The safety director is also responsible for the assignment of shelter areas and for constantly seeking means to improve the effectiveness of these areas.

We are presently installing an auxiliary communications system which will provide inter-plant communications in the event that the regular telephone facilities are knocked out. This system will tie in with several communications centers located in emergency areas throughout the plant areas. Better communications with local civilian defense, city and state fire and police departments are also being worked out.

In addition to the physical equipment aspects of communications, we have recognized the need for frequent meetings of key personnel to examine our disaster program. For example, our disaster planning committee is comprised of members from plant engineering and maintenance, the various manufacturing divisions, engineering research and development departments, industrial relations section, the Government coordination group, and our sales department. Regular meetings of this committee have been held ever since our disaster plan was formulated and put into effect several years ago.

Importance of Meetings

Meetings of this type are particularly important to a corporation whose activities have been as fully decentralized as they are at Mallory. It is up to this committee to pass on new ideas for constantly improving the disaster program. At each meeting, priorities are asigned to agreed-upon improvements.

Coordination is not simply confined to emergency problems, but also is practised to obtain a broad cross-pollination of engineering knowledge with the new engineers and the experienced technical groups. Our Engineering Executive Council, with representation from the engineering sections of all of our plants, coordinates all major engineering programs. In this way, we cause an important disbursement of our engineering know-how and, in effect, produce a know-how stockpile.

Coordination and cooperation also extend beyond our corporation to include neighboring organizations. As an example, we have worked with nearby companies in developing an inventory list of emergency equipment, such as fire-fighting apparatus, bulldozers, trucks, and portable communications equipment. Thus, such facilities can be readily pooled should the need arise.

It is difficult to obtain sufficiently qualified personnel to operate a complex plant today. It is obviously much more difficult to man such plants during wartime. A partial solution to this problem may be an extension of automation. Wherever economically practical today, we install automatic equipment to reduce the problem of the short supply of specially skilled workers. This automatic equipment will be even more valuable during an emergency.

In closing, I would like to stress the fact that in formulating our disaster program we took full advantage of the experience and know-how of the various military and Government agencies, especially the Business and Defense Services Administration of the U. S. Department of Commerce, which has done an excellent job in coordinating and integrating the many phases of disaster planning.

- - - — - —

Times Facsimile

(*Continued from page* 42)

newspaper presses.

Thanks to good planning and preliminary tests, the week-long experiment was a success. The shortest transmission time was 35 minutes for the full 10-page edition. This time included conversation on the telephone circuit as well as swap-over time between the machines. The smallest type sent, incidentally, was 5-point agate; fractions, accordingly, would correspond to about 2½-point. (The page you are reading is set in 10-point type.)

What's next? Well, Austin Cooley admits he doesn't know. He adds, however, "A lot of people including ourselves believe this points up the possibilities of a new, faster, and better communications system which enjoys the advantages of being error-free. This is, of course, an important factor in transmitting copy such as financial reports."

This latest achievement in facsimile, incidentally, marks something of an anniversary for Mr. Cooley. In 1935, he built for *The Times* the first portable facsimile machine capable of sending news photos over ordinary telephone lines. Facsimile was then made an important part of *The Times*' own picture service, Wide World Photos.

Since about 1939, the U. S. Army Signal Corps has been investigating various facsimile systems that would transmit reconnaissance photographs, drawings, maps, and other intelligence from base to base. It standardized on Times equipment for military procurement throughout World War II.

Since the end of the war, Times Facsimile has brought transmission of photographs, printed matter, and charts by radio and telephone to a higher degree of efficiency. The company's equipment is being used by the three military services, the U. S. Weather Bureau, the Associated Press, International News Photos, RCA Communications, and communications companies in many countries overseas.

- - - — - —

Lesson from a bee...

SHOWN HERE 6 TIMES ACTUAL SIZE IS THE GRID FOR VARIAN'S VA-203B KLYSTRON

The cell structure of a honeycomb inspired this ingenious klystron grid-making technique. Pioneered and perfected by Varian as a mass production process performed chiefly under microscopes, it consists of forming a bundle of fine copper-plated aluminum wires into a solid, honeycomb-like structure . . . then etching out the aluminum.

The end product is a pure copper grid having extremely low microphonics, high power handling capacity and great rigidity . . . essential requirements for airborne klystrons.

Of all known methods, this has proven the *only* one that assures optimum grid performance and reliability under conditions of extreme shock and vibration. Painstaking techniques like this typify Varian's manufacture of more than 60 different klystrons for every application.

FOR COMPLETE INFORMATION
write for the new Varian klystron catalog . . .
address Applications Engineering Dept. L-11

THE MARK OF LEADERSHIP

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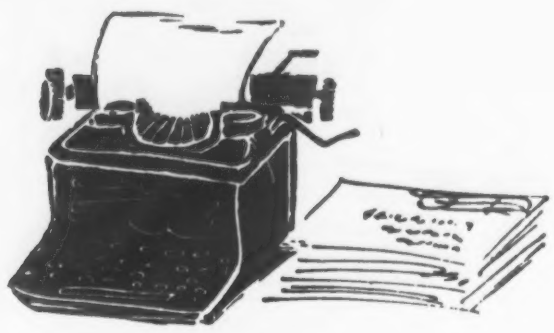
KLYSTRONS, TRAVELING WAVE TUBES, BACKWARD WAVE OSCILLATORS, LINEAR ACCELERATORS, MICROWAVE SYSTEM COMPONENTS, R. F. SPECTROMETERS, MAGNETS, MAGNETOMETERS, STALOS, POWER AMPLIFIERS, GRAPHIC RECORDERS, RESEARCH AND DEVELOPMENT SERVICES

SHOWN HERE 6 TIMES ACTUAL SIZE IS THE GRID FOR VARIAN'S VA-203B KLYSTRON



Our Readers Write

Praises For SIGNAL

DEAR SIR:

This is a "thank you" letter, and one long overdue. Ever since I was assigned to this office last January, I have become increasingly aware of the outstanding job which your publication, particularly, and service journals generally, are doing in acquainting a sizeable segment of the public, your specialized audience, with the Army's mission, needs, and accomplishments.

The important part played by Service journals in creating public understanding of and support for the Armed Forces certainly merits recognition. I should like to add my bit, taking this means of expressing my appreciation to you and the staff of SIGNAL.

Sincerely,

G. S. MELOY, JR.
Major General, GS
Chief of Information
U. S. Army

What Is Your Opinion?

Through the courtesy of Captain E. F. Metzger, President of the London Chapter, AFCEA, the following letter addressed to him by Commander H. St. A. Malleson, R.N. (Rtd.), was forwarded. It is of particular interest and is constructive. NOTE: Commander Malleson has an individual membership in AFCEA outside the group membership enjoyed by the Mullard Co., London.

The point I wish to raise is in connection with the journal SIGNAL . . . I hope you do not mind if I make one or two criticisms . . . and you can, of course, rule me out of order if I am not entitled to make these criticisms. . .

Briefly, in the first place, it is noticeable that contributions from countries other than the U.S.A. do not appear in the journal; is this by design, or because nobody has offered contributions? Secondly, the general standard of the contents is, in my opinion, directed to the "popular" level, and while this may suit readers in the U.S.A., it does not heighten the prestige of the journal with me. In general, the emphasis in the journal is entirely domestic to the U.S.A., with the very minor exceptions of items dealing with local chapter activities, which are so brief as to make no difference.

This whole situation makes one ask whether the stated aims and objects of the Association really take into account the opinions and activities of foreign nationals and companies who become members. In view of the preponderance of membership in the U.S.A., I am naturally prepared to hear that the journal must speak for that majority.

H. ST. A. MALLESON
Commander R.N. (Rtd.)

• ——— •

AFCEA President's reply to the letter from Commander Malleson:

The absence of articles in SIGNAL from countries other than the USA is assuredly not by design. It is partly due to the fact that no one abroad has offered to contribute, but more to the fact that up to the present SIGNAL has never pursued an aggressive policy of soliciting editorial material. This has, in the past, applied both to domestic and foreign articles. As a result of our recent reorganization policy, there will be a more aggressive policy to obtain editorial material which, I am confident, will include our overseas membership. Meantime, any articles submitted by our foreign associates would be most welcome.

In answer to your second criticism, the very broad base of our membership, which includes communications and electronics in both operation and production, and the impossibility of competing with the many fine scientific journals now published in the U.S., have dictated a policy of publication on the "popular" level. SIGNAL tries to include material of general interest to its whole membership. This policy, however, does not exclude scientific material of interest to special category members.

I am most grateful for your suggestions and it is heartening to find such an interest in the London Chapter. We are trying to improve the editorial material of SIGNAL and of the NEWS LETTER. Under a new policy, the NEWS LETTER will appear as a NEWS LETTER edition of SIGNAL in the months when SIGNAL is not published. In the regular issue of SIGNAL, the NEWS LETTER will be included as a regular feature.

I am sure you will follow these changes with interest and any suggestions resulting from your observations of future issues of SIGNAL will be more than welcome.

Meantime, send us an article.

Sincerely,

PERCY G. BLACK
National President

• ——— •

Extract from a letter by Captain E. F. Metzger, President of the London Chapter, AFCEA:

As you will recognize, the status of a foreign chapter and, in particular, the London Chapter, is somewhat different from that of a U.S. chapter, and I believe that every effort should be made to encourage the maximum interest and participation by the foreign members. The record of the London Chapter since its beginning has been one of steady development and we are hopeful that we can maintain the level of interest. The U.S. membership is, of course, quite restricted in its potential, since the U.S. Armed Forces and U.S. industrial personnel in the London area are relatively few. The British members have been extremely cooperative in their furtherance of the development of the local chapter. We are looking forward to a good year, and, of course, we welcome any help the National Headquarters can give us.

E. F. METZGER
Captain, USN
President, London Chapter

Editorial Note: The recent September-October issue of SIGNAL carried a request to all foreign and domestic chapters and individual members to submit articles of interest. We look forward to the acceptance of this invitation.

• ——— •

DEAR SIR:

It is my personal view that SIGNAL should look into the possibility of publishing a "technical" article from time to time. Many other members with whom I have talked share my thought—a few do not. However, I believe it worthy of consideration. There are many subjects of engineering, research, and application which tie in with the work being performed for the Armed Forces by manufacturing facilities. Such articles would serve a dual purpose. They would provide great reader interest and at the same time afford manufacturing firms the opportunity to make known their technological advancements throughout the broad field of electronics and photography. May I suggest you study the possibility of this suggestion.

AFCEA MEMBER
Washington, D. C.

Convention Enthusiasm

DEAR SIR:

. . . The generous donation of banquet tickets enabled many students to attend the [AFCEA Convention] banquet who would not normally have had this opportunity. Such an opportunity went a very long way towards making this convention a memorable affair which they will look back on many times in the future.

It is evident how impressed the students were by the enthusiasm and preparations already present for next year's convention. Your generosity has been largely responsible for this enthusiasm.

We wish to again express our thanks and appreciation, and hope that you found the Convention as rewarding as we at Northeastern did.

Sincerely,

J. C. MANNING
Chairman
1956 Convention Student Committee
Northeastern University Chapter

Association Affairs

AFCEA

1624 Eye Street, NW
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Phone: EXecutive 3-3033

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†*Executive Committee Member, non-voting.*

New Regional Vice Presidents

The Executive Committee has appointed the following Regional Vice Presidents to fill vacancies created by the pressure of business duties:

Region A: Henry R. Bang of the New York Telephone Company, succeeding Theodore L. Bartlett.

Region E: John R. Howland, Dage Television Division, Thompson Products, Inc., succeeding Darwin H. Deaver.

New AFCEA Chapters

Frankfurt, Germany

The Frankfurt, Germany, Chapter was chartered in September by the AFCEA. Organized by George A. Spear, it is the twelfth chapter to be formed outside the continental USA.

Officers elected to head the new chapter are: George A. Spear, president; Lt. Col. Elton D. Vaughan, 1st vice president; Maj. John F. Buzerak, 2nd vice president; Harry A. Chalekain, secretary, and Raymond E. Spence, Jr., treasurer.

South Carolina

The successful reactivation of the South Carolina Chapter, which had been inactive for several years, was accomplished on October 4th. Maj. General Alvin L. Pachynski, Director of Communications - Electronics, USAF, addressed the reorganization meeting held at Shaw AFB. Other guests were Brig. Gen. Bruce K. Holloway, Deputy Commander, 9th Air Force, and Ralph S. Grist, AFCEA Regional Vice President.

Capt. J. T. Howard, USA (Ret.), directed the reactivation, with the assistance of Col. Hubert N. Sturdivant, Cdr. 8th Comm. Group; Lt. Col. Arthur W. Askey, Hqs. 9th Air Force; and Cdr. T. R. Gray, District Comm. Officer, Hqs. Sixth Naval District.

Officers were elected as follows: president — Col. Manuel Fernandez, Donaldson AFB; vice presidents — Cdr. T. R. Gray; Maj. B. H. Olmsted, Fort Jackson; Oscar C. Tigner, Southern Bell T&T Co.; secretary-treasurer—F. L. Davis, Southern Bell.

Introducing AFCEA's New Group Members

Bell & Gossett Company

The AFCEA welcomed Bell & Gossett Co., Morton Grove, Ill., as a group member in September. The company produces electronics-communications systems, heat tranfer equipment, and chemicals.

The company representatives in the Association will be: R. E. Moore, president; C. E. Pullum, executive vice president; H. A. Lockhart, vice president engineering; O. F. Johnson, manager; C. H. Stewart, II, chief engineer; R. S. Perrill, produc-

Pictured below: Col. Fred J. Elser, Chief of the Fort Monmouth Signal School Doctrine Office and president of Fort Monmouth chapter, presents the AFCEA award for "outstanding scholastic achievement" to 2/Lt. Joseph Logan who was honor graduate in Section 743 of the Signal Officer Basic Course. Looking on is Lt. Col. H. T. Shafer, Director of the Officers Department of the School.

Companies Accepted for AFCEA Group Membership Since September 1, 1956

Bell & Gossett Company
A brief note about this company appears in this issue.

307 new AFCEA individual members from Sept. 1 to Nov. 1

tion manager; W. E. Peugh, sales manager; C. E. Baker, Jr., project engineer; R. D. Ryerson, project engineer; E. P. Herrick, production engineer.

Colonel Kenneth S. Stice (Ret.)

AFCEA headquarters was saddened to hear the news of the death of Col. Kenneth S. Stice, a Decatur Chapter member, on August 11th.

Colonel Stice was active in the telephone, meteorological, electronics and communications fields for years. He was a loyal AFCEA member. During the ten years of his retirement, he devoted much of his time to interesting others in the AFCEA.

Executive Changes At AT&T

Frederick R. Kappel, a National Director of the Armed Forces Communications and Electronics Association, has been elected the ninth President of the American Telephone and Telegraph Company. He succeeds Cleo F. Craig, who has been named chairman of the AT&T Board.

Mr. Kappel has enjoyed a 32-year career with the Bell System and was AT&T vice president in charge of the Operation & Engineering Department for four years before his election as Western Electric president in 1954.

Mr. Kappel has had wide and successful experience in telephone operations, and his accomplishments cover a vast area in industry. During his presidency of Western Electric, the company played a key role in such important defense projects as the Nike guided missile and the distant early warning (DEW) line, and has continued as one of the foremost suppliers to the Government of essential electronic and communication equipment.

Succeeding Mr. Kappel as president of Western Electric is Arthur B. Goetze, previously Vice President-manufacturing of the company.

Mr. Goetze began his Bell System service with Western Electric in 1917 as a draftsman. He has been with the company for nearly all of his 39-year career, except for the period 1949-52, when he served first as vice president-personnel of the Chesapeake & Potomac Telephone Companies for one year and then as vice president-operations and a member of the Board of Directors of the Ohio Bell Telephone Co.

1957 AFCEA Convention & Exhibits

Plan now . . . . don't delay

Washington, D. C. — May 20, 21 and 22

Sheraton-Park Hotel

Program & Exhibits

All at the Sheraton-Park

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Top-level coverage from Industry and Government

Objective: To top all conventions

Plans include:

Luncheons & Receptions: **The Best.**

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Banquet: **Top-flight speaker and real get-together.**

Plan to bring your family. They will enjoy the Nation's Capital.

AFCEA Convention News

We cannot stress too strongly the importance of making hotel reservations for the 1957 Convention. Two hotels have received reservations already from members who are familiar with the Washington tourist rush during April, May, and June. This is to say nothing of the thousands of school children all over America who will be making educational trips to the National Capital. Even though your Convention committee representatives have reserved a goodly number of spaces at the Sheraton Park and Woodner Hotels, you cannot afford to wait until the last moment. Space will be held at the above hotels for a reasonable time before the Convention, but do not delay.

The Convention Chairman, Admiral Joseph R. Redman, USN (Ret.), has sent memos to all Chapter Presidents enclosing rate and reservation cards. If you are not a chapter member, why not write directly to the hotels mentioned above for information; or, if you wish, contact the National Headquarters in Washington. The following addresses are listed for your convenience:

Sheraton Park Hotel
Connecticut Avenue & Woodley Road, N. W.
Washington 8, D. C.

Woodner Hotel
16th Street & Spring Road, N. W.
Washington 10, D. C.

National Headquarters, AFCEA
1624 Eye Street, N. W.
Washington 6, D. C.

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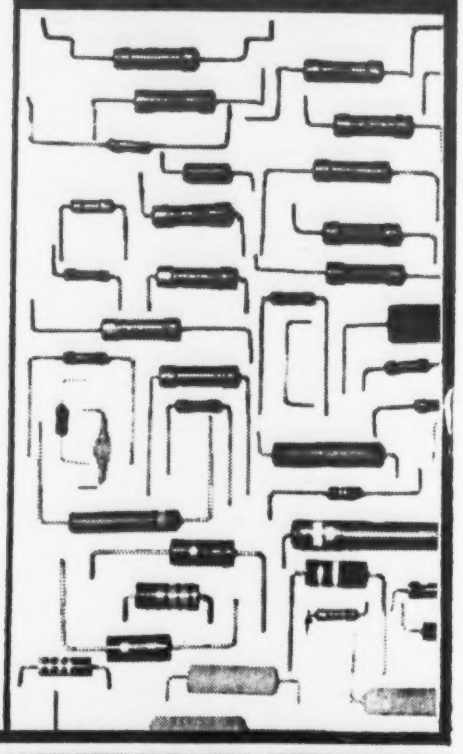
"PIG-TAILOR"* T.M.

For PREPARATION of axial lead components

PREPARED COMPONENTS IN SECONDS WITH THE "PIG-TAILOR"



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. . . . a revolutionary new mechanical process for higher production at lower costs. Fastest PREPARATION and ASSEMBLY of Resistors, Capacitors, Diodes and all other axial lead components for TERMINAL BOARDS, PRINTED CIRCUITS and MINIATURIZED ASSEMBLIES.

The "PIG-TAILOR" plus "SPIN-PIN"—accurately MEASURES, CUTS, BENDS, EJECTS & ASSEMBLES both leads simultaneously to individual lengths and shapes—3 minute set-up—No accessories—Foot operated—1 hour training time.

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2. Uniform marking exposure.
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5. "U" leads for printed circuits.
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PIG-TAILORING eliminates:

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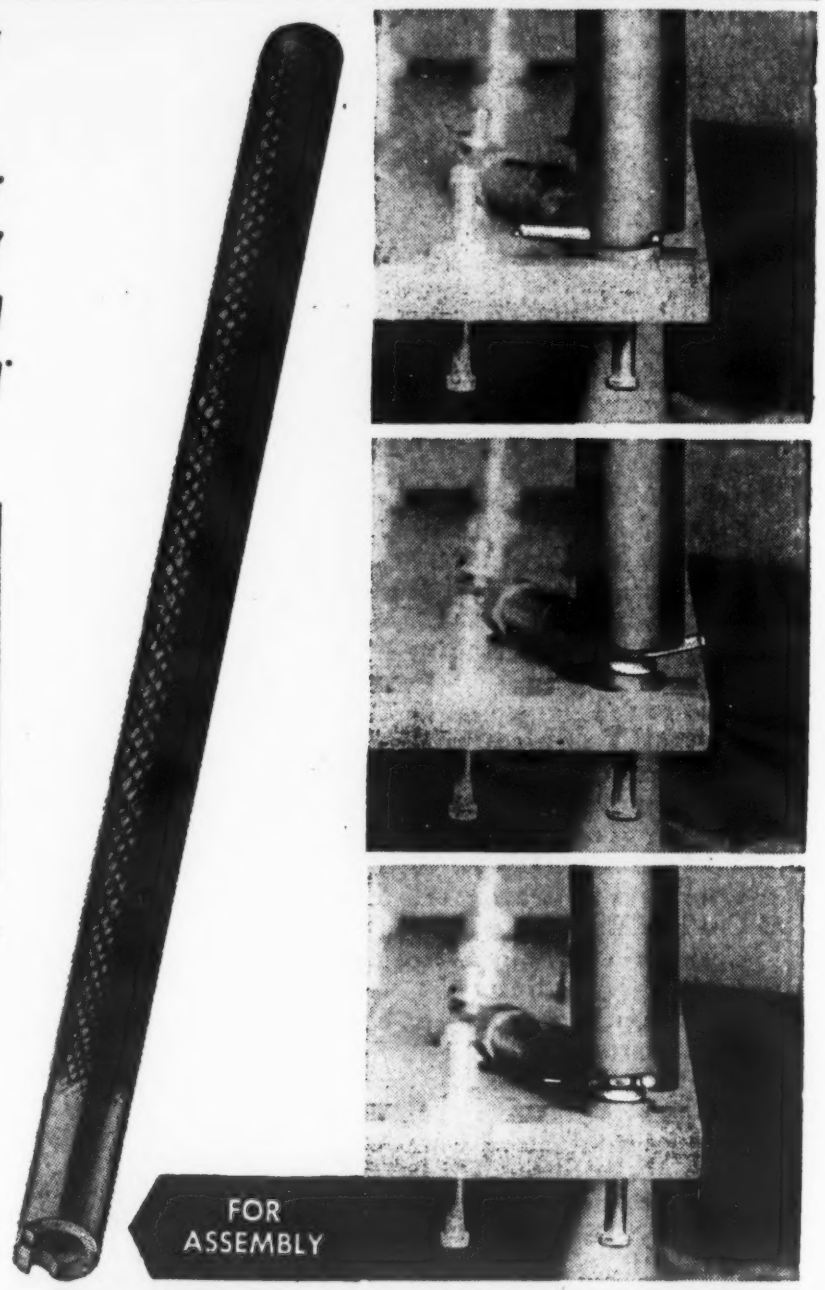

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* PATENT PENDING

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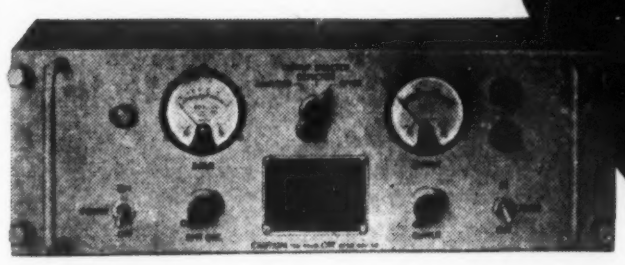

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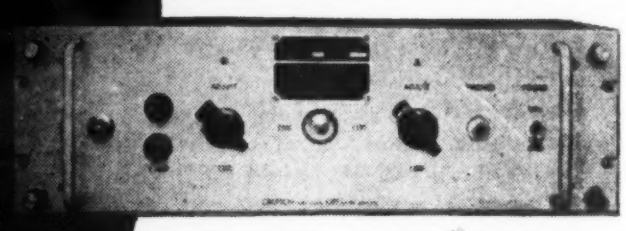

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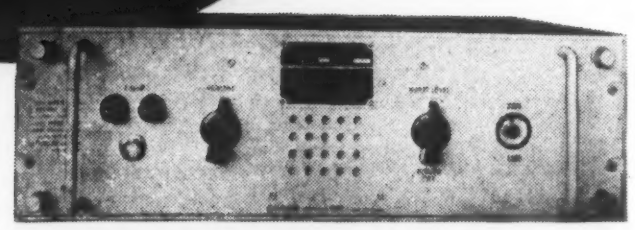

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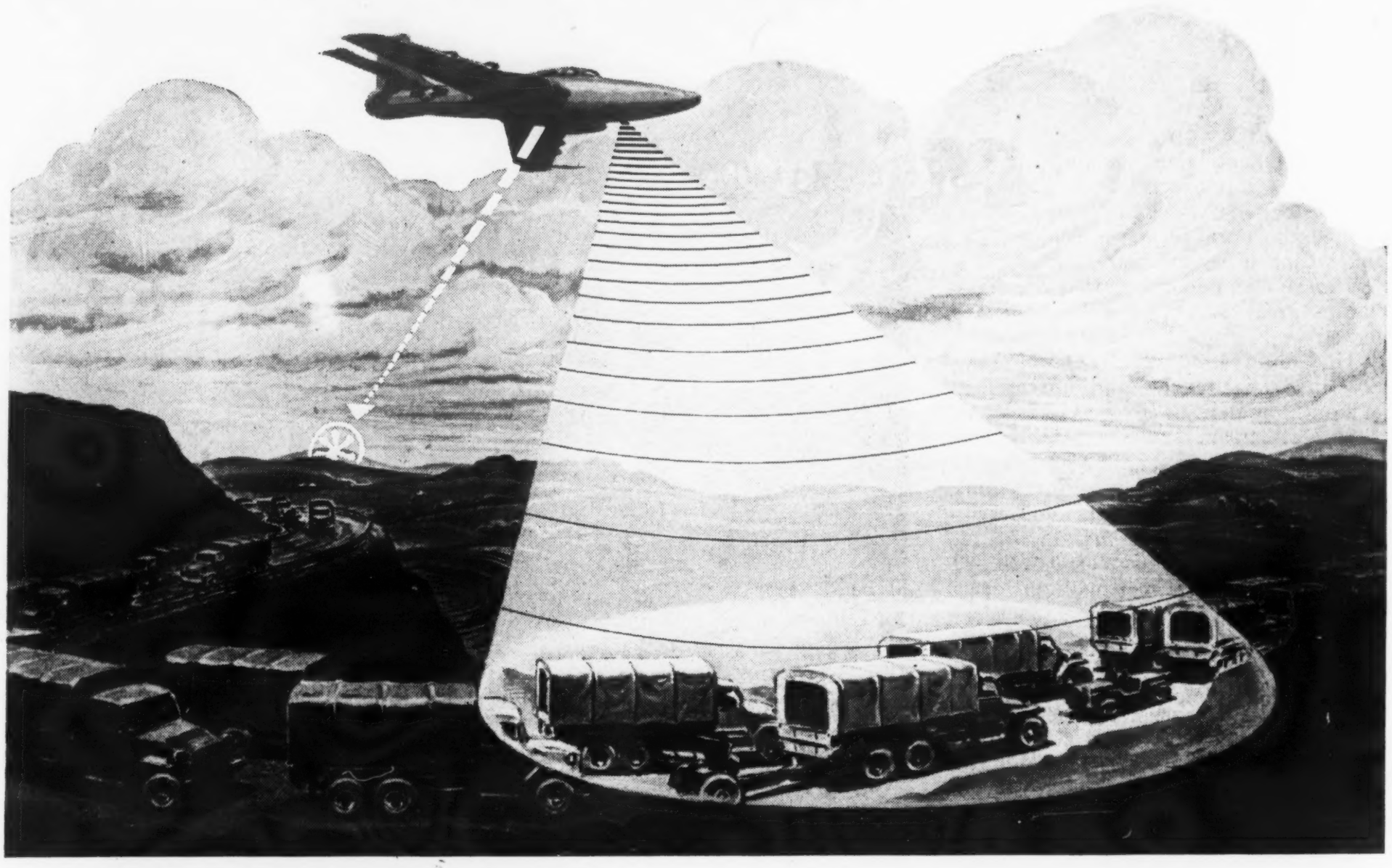

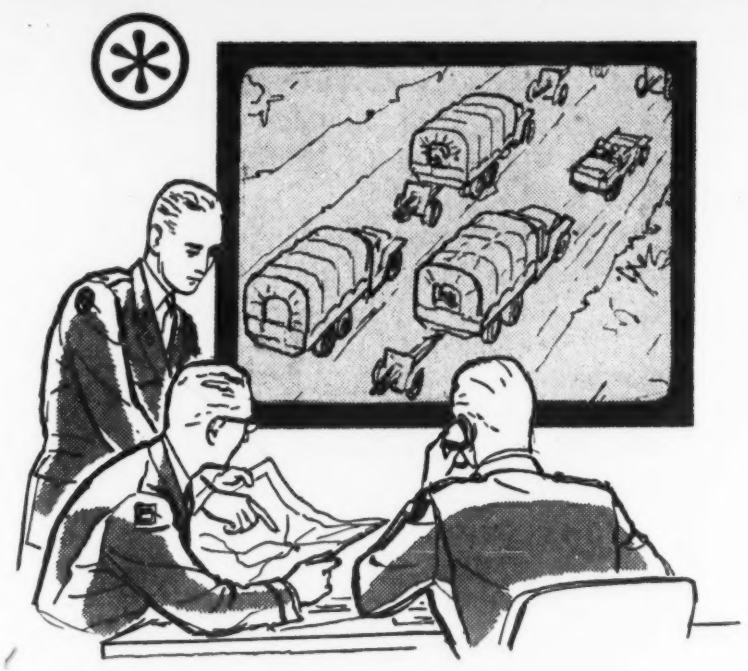

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Chapter News

Atlanta

At the September meeting of the chapter, a top executive of Southern Bell Telephone and Telegraph Co., retracing the upsurge of the economy in this region in recent years, said, "Very few large cities in the nation are having as great a rate of growth as Atlanta."

This observation was made by Ben S. Gilmer, vice president, operations, of Southern Bell, at a meeting held at Fort McPherson.

Mr. Gilmer said population growth is an indication of the business and industrial growth which has followed. For example, he stated that in the 11 years since the end of World War II, population in the metropolitan area rose from 601,000 to 865,000, increasing 43 per cent.

More impressive still, he emphasized, was that in a little more than six years, since the 1950 census, the population increased by 170,000, or 24 per cent.

He said that this leads people to wonder when the city will reach a million population.

Since utilities, such as the telephone company, have to estimate the future needs for utilities, and planners must forecast the requirements for schools, streets, and the like, surveys are constantly made with population growth in mind.

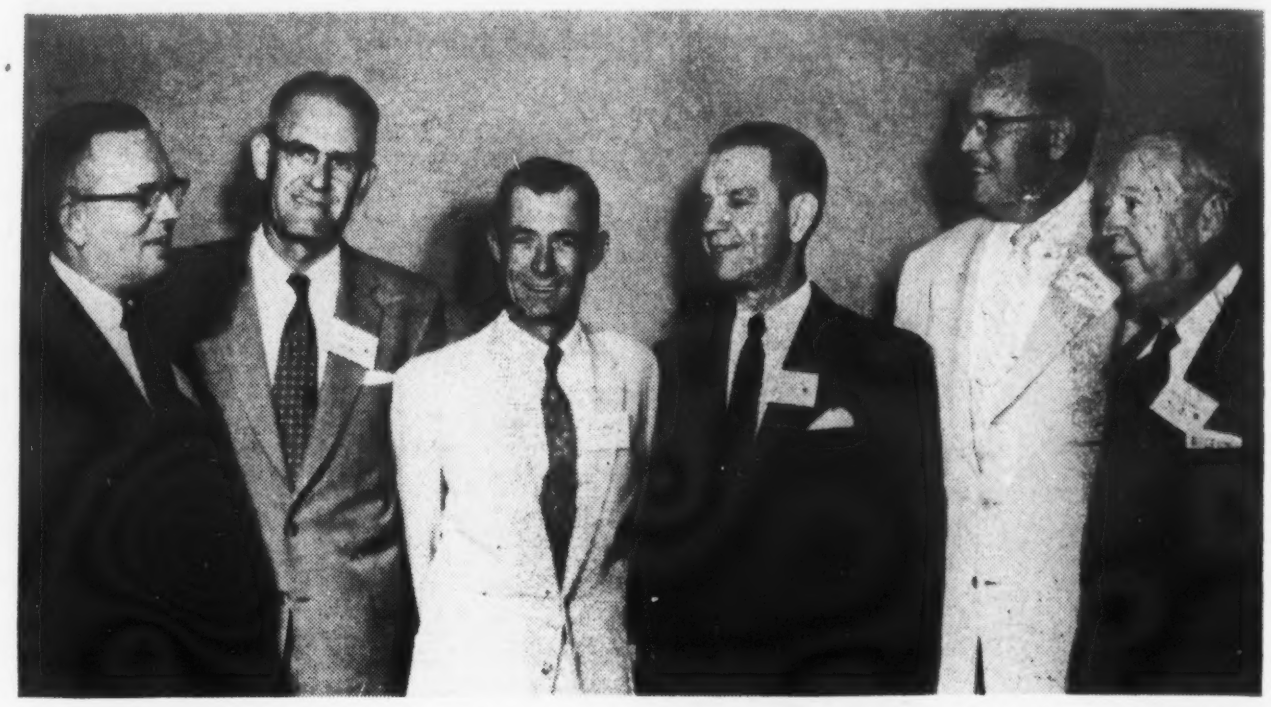
He said present estimates are that the metropolitan Atlanta area will have a population of a million people by 1961, and will rise to 1,500,000 twenty years from now. "Even this forecast," he said, "may prove to be too low."

Mr. Gilmer pointed out that the area has almost unlimited land space in all directions available for expansion, whereas most large cities are on large rivers or sea coasts "and just don't have room to grow."

Thus, he stressed, Atlanta is in a particularly advantageous position to attract more than an average share of the Nation's large population growth.

Mr. Gilmer said more than 3.000 national concerns have branches here, and that 80 federal departments and agencies employing 14,000 civilian workers are located here in regional offices.

The 1957 officers for the chapter are: president, C. M. Eberhart; vice presidents, Lt. Col. Donald L. Adams, R. J. Smith, William F. Johnson, and A. E. Arnold; secretary-treasurer, A. J. Cartey; board of directors, Lt. Gen. A. R. Bolling, Capt. Jesse Draper, M. G. Halligan, Lt. Gen. Thomas F. Hickey, Elliott R. Jackson, W. L. Mollands, W. Kelly Mosley, John E. Ramsey, and Fred J. Turner.



Shown at Atlanta Chapter's September meeting, left to right: President Charles M. Eberhart; Director Kelly Mosley; Lt. Col. Plato S. Rhyne; guest speaker Ben S. Gilmer, Southern Bell T&T vice president; H. C. Booth, Southern Bell T&T vice president, and Ralph S. Grist, AFCEA regional vice president.

Augusta-Fort Gordon

At the chapter's August 16th meeting, a cocktail hour and a steak dinner preceded a speech by Allen Douglas, executive director of the Committee of 100, an organization set up to attract new industry to the Augusta area.

The meeting began with cocktails and a get-acquainted period for the chapter's guests, all of whom were on Reserve Officer training duty at Fort Gordon. They were formally introduced later in the evening by Maj. J. D. Hartline.

Dinner was served at 8:30 and Colonel Carter gave the invocation at the request of Chapter President Woodward. After dinner, Mr. Woodward introduced the speaker, Mr. Douglas, who gave an interesting explanation of the activities of his organization.

The chapter has expressed its regret in losing one of its most active and able members, Maj. Hartline, who has been transferred. His friendly willingness to serve in the chapter's activities will be missed by all.

At the September meeting, after cocktails and dinner, Mr. Woodward called the meeting to order and recognized all new members and guests.

Col. Otto Sarr announced that Maj T. M. Firing was leaving Fort Gordon and that Maj. Phil Moore had already gone to the far East.

The speaker of the evening was Mr. Orvel Bumpers, manager of the Clarks Hill Reservoir, who gave some very interesting facts and information about Augusta's most popular recreation area. He spoke before an audience of 32 members and guests.

Baltimore

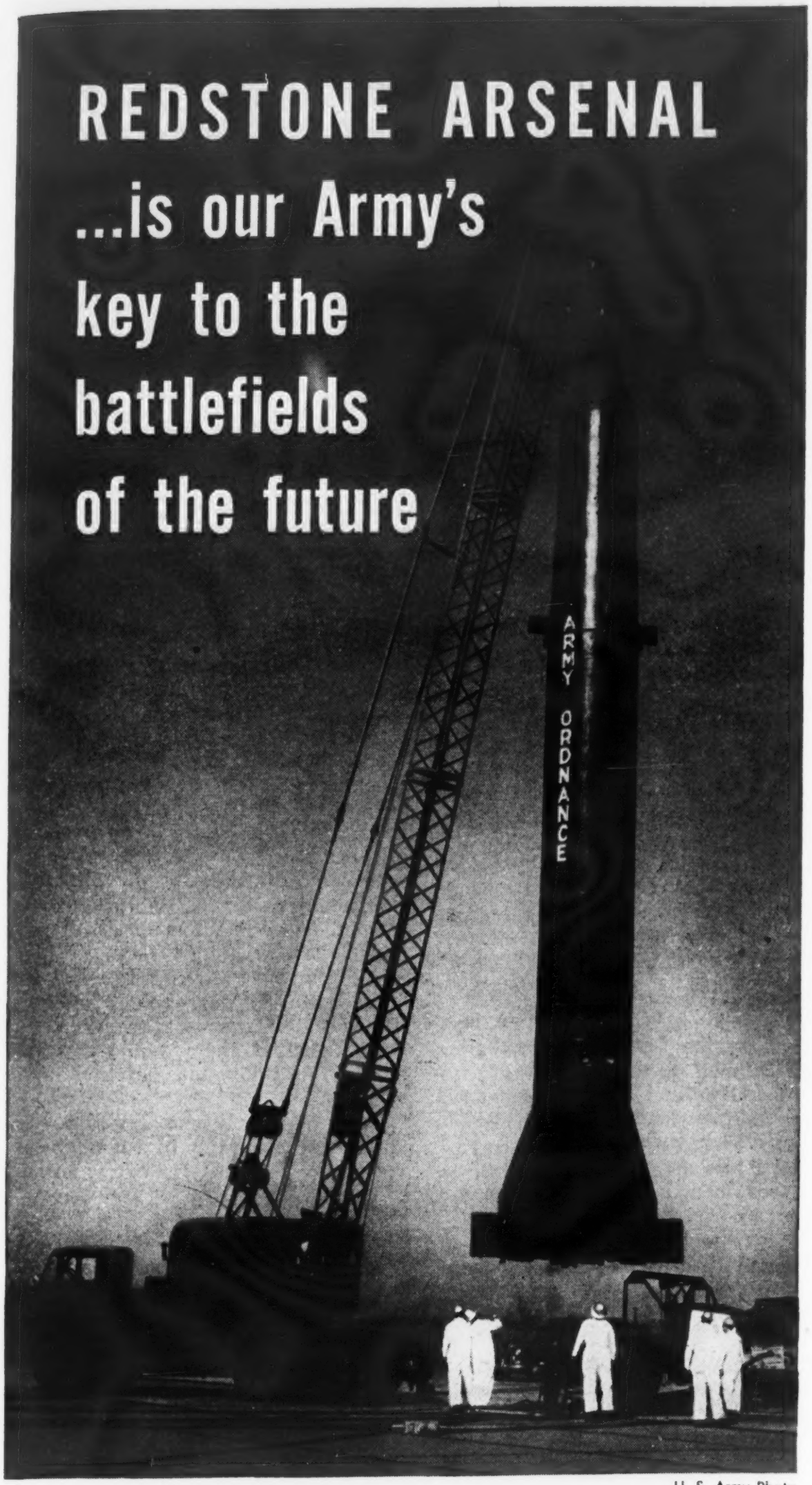
The chapter's September 15th meeting, the first meeting of the 1956-1957 season, was highlighted by the group's first trip to the Pentagon Communications Center. Col. Edwin H. Rhatigan, Chief of Management Office, Second Army Signal Section, served as host to the chapter.

Eighty members and guests met at the Fort Meade Officers Club for cocktails and luncheon. During luncheon, George C. Ruehl, chapter president, introduced those at the head table, among whom were the host, Colonel Rhatigan. Mrs. Rhatigan, Col. Timothy McKenzie, new Chief Signal Officer of the Second Army Signal Section, and Mrs. McKenzie, LCdr. J. G. Bastow, and Major V. G. Phillips of the Aberdeen Proving Ground.

Colonel Rhatigan then welcomed the members, and on the behalf of Col. Julian P. Lindsey, Post Commander, who was out of town, extended his best wishes. He announced that the Communications Center trip was arranged in cooperation with the Chief Signal Officer's Office, Washington.

After luncheon, Army transportation was furnished to take the group to the Pentagon, where they were greeted by Major Manning, who is in charge of the Communications Center, and Captain Sullivan, who is from the Office of the Chief Signal Officer. During the tour, Captain Sullivan explained to the AFCEA guests the complex workings of the center.

REDSTONE ARSENAL ...is our Army's key to the battlefields of the future



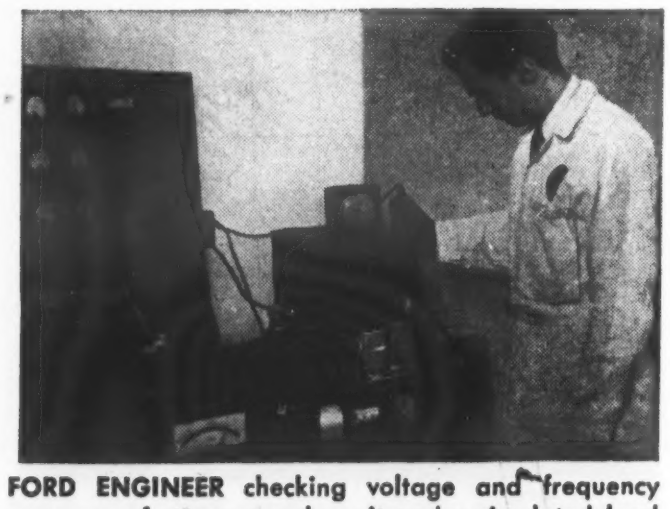
U. S. Army Photo

• One of eight permanent Ordnance Corps arsenals, Redstone is the center for the Army's rocket and guided missile program. Its 40,000 acres are located on the Tennessee River near Huntsville, Ala., and house research laboratories, environmental test equipment and several rocket-testing ranges. Redstone Arsenal's military and civilian scientists and engineers produce weapons ranging from a tiny training rocket to the giant IRBM, now being developed on a crash basis by the recently-established Army Ballistic Missile Agency.

From the research, development, production and field service headquarters located at Redstone flow thousands of directives covering the rocket and guided missile work being done by research laboratories, universities and private industry throughout the nation. Weapons systems developed by this Ordnance-Industry team include the Super Bazooka infantry rocket, the Honest John artillery rocket, the Corporal missile and the Nike anti-aircraft missile.

Scientific barriers of all kinds are being broken by the 9,000 employees of Redstone Arsenal, but the exciting and difficult technology of guided missile development constantly presents new problems. Electronic computers click away at missile trajectory formulas by day, while at night rockets equipped with headlights streak down-range, adding valuable data to our country's newest arsenal of defense.

REDSTONE BALLISTIC MISSILE — This long-range rocket-powered, bombardment weapon was developed by the arsenal's guided missile team headed by Dr. Wernher von Braun. The Redstone is the progenitor of the Army's IRBM, the Jupiter.



FORD ENGINEER checking voltage and frequency accuracy of power supply unit under simulated load conditions in a project for the Guided Missile Development Division of the Redstone Arsenal.

This is one of a series of ads on the technical activities of the Department of Defense.

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CHAPTER NEWS

Boston

The following slate of officers for 1956-1957 was chosen at the chapter's last meeting: president — Fred E. Moran, Western Union Telegraph Co.; vice presidents—Col. Murray D. Harris, Dept. of Military Science; Frank Lyman, Jr., Cambridge Thermionic Corp.; treasurer — William Melanson, Cambridge Thermionic Corp.; secretary—Louis J. Dunham, Jr., Franklin Technical Institute; directors—D. R. Hull, Raytheon Manufacturing Co.; Raymond B. Meader, New England Telephone and Telegraph Co., and Gardiner G. Greene, Browning Laboratories.

Newly elected committee chairmen are: Capt. A. R. Taylor, USN, (Ret), program; Edward R. Chasson, New England Telephone and Telegraph Co.. membership; Robert B. Richmond. General Radio Co., reception; and Jack Hobby, Raytheon Manufacturing Co., publicity.

Chicago

Colonel William Donics, Assistant Chief, Communications and Electronics Division, Directorate of Development. Headquarters, Air Research and Development Command, United States Air Force, was the guest speaker at the chapter's first meeting of the year at the Hallicrafters Corporation on September 27th.

In his timely speech on "A New Environment for Airborne Equipment," Colonel Donics brought out the point that, "With the advent of nuclear power in aircraft we cannot approach the problem as a simple integration of a new type of power plant in a specific airframe, but rather we must consider the impact on each and every field that is an integral part of a weapon system environment. In this respect, it is difficult to establish which area is most critical. The electronics engineer, of course, has a very good case, but, by the same token, so does the aerodynamicist and the nuclear scientist. But all of them will readily agree that progress in their respective fields usually hinges on one prerequisite; namely, the availability of materials to meet their unique requirements. Thus, materials and their behavior have truly become the key to our progress in this particular environment."

For further remarks made by Colonel Donics see "Quotes in Review," page 52 of this issue.

Chicago's September 27th meeting was addressed by Col. William Donics, Asst. Chief, Communications and Electronics Div., Directorate of Development, Hqs, ARDC, USAF. Pictured below, left to right, are: William J. Halligan, Jr., and David S. Higgins, vice presidents of Hallicrafters Corporation, who were hosts to the chapter; Colonel Donics, and President Raymond K. Fried.

Fort Monmouth

More than 100 members turned out to hear a talk on "Communication in Undersea Warfare" and a presentation of a film on "Atomic Submarines," which were featured at the chapter's first fall dinner-meeting on September 20th at Gibbs Hall Officers Club.

The speaker, an expert on the subject, was Frank C. Lynch, Jr. who is attached to the Operations Research Division of the Electric Boat Co.

The chapter's drive to raise the membership to 1,000 persons still continues at full speed.

The Second Army Signal Section was host to the Baltimore Chapter on September 15th. A luncheon-meeting was followed by a tour of the Pentagon Communications Center. Above, left to right: Col. George V. Johnson; Col. Timothy McKenzie, Signal Officer, Second Army; President George C. Ruehl, and Lt. Col. Edward T. Rhatigan.

Gulf Coast

At the September meeting Maj. Don Poling, chapter president, discussed the possibility of interesting local radio station personnel in the AFCEA. Mr. George Sheffield, from Southern Bell Telephone Co., indicated that he would contact the chief engineers at each of the local stations and invite them to the next meeting.

Reporting further on the chapter's educational program, Major Poling stated that AFCEA members will participate in the guided tours of high school students through Keesler Air Force Base. It was agreed that only 11th and 12th graders will make these tours and that there would be four groups from Biloxi and four from Gulfport.

The evening's activities were concluded with a showing of a film, "Semi-Automatic Ground Environment (SAGE).

Keflavik

Some forty-nine members and guests were present at a dinner and monthly meeting of the chapter on September 11th. The evening's speaker was Mr. Harold G. Austin of Page Communications Engineers, who discussed "The Advantages and Problems Encountered in the FPIS Communications."

After Chapter President Maj. George C. White called the meeting to order he read the chapter's charter which had recently been received. Then it was announced that Capt. Wallace B. Fields of the 932nd AC&W Squadron would be chapter secretary, taking over the duties from Paul E. Wagner, Page Communications Engineers, who was transferred to the United States. A new arrival at Keflavik, Maj. Marvin Muller, was introduced to the group.

Colonel Murrill, Commander of the 932nd AC&W Squadron, invited the chapter to hold the next scheduled meeting at the AC&W site. The president accepted, and the program of

the next meeting was discussed.

Mr. Austin, the guest speaker, then presented his discussion on the FPIS communications and had a questioning period, inviting audience participation. Following the discussion, Major White concluded the evening with a brief presentation of a rundown on tropospheric scatter in Iceland.

Louisiana

Capt. John P. Herrman, chief cameraman for Paramount Pictures and a member of the second Byrd Antarctic 1933-35 Expedition, spoke before an audience of more than fifty members and guests at the chapter's September 10th meeting.

The noted cameraman's lecture on the Antarctic expedition was highlighted by a motion picture which he showed with the help of his assistant, Max Goodman.

Captain Herrman, who specializes in aerial and color photography, is on call for the motion picture industry. At the time of his lecture, he was participating in the filming of "Wings for the Eagles" with John Wayne and Maureen O'Hara.

At the meeting, Chapter President Charles Pearson, Jr., introduced past chapter president, C. C. Walther; vice president, Dr. Joseph C. Morris; treasurer, J. D. Brown, and chairman of the arrangements committee, Paul D. Cordes.

Distinguished guests who attended the meeting were: Col. Joseph Tate, Assistant Director, Civil Defense; Capt. W. A. Hood, Commanding Officer, Naval Air Station; Col. W. R. Lytz, Director, 8th Marine Corps Reserve; Lt. E. W. Messenger, Communications Officer, Naval Air Station; Dr. Anees Mogabgab, Managing Director, Veteran's Administration Hospital; Col. James Moreau, Deputy State Director, Selective Service; Col. Mark Roy, Commander, Air Reserve Center; Father Carl J. Schutten, Pastor, St. James Church; Joseph Sendker, publisher, *Plaquemines Gazette;* Col. Charles Sommers, professor, M. I. Science Tactics, Tulane University, Air ROTC; Gen. F. A. Woofley, former state director, Civil Defense; Capt. S. F. Gray, Executive Officer, 8th Coast Guard District; Lt. H. J. Le Blanc, Communications Officer, U.S. Coast Guard; Victor Schiro, councilman, City of New Orleans, and Arthur Lamont, press agent, United Artists.

New York

On September 27th, 160 chapter members and guests met at the Belmont Plaza Hotel to hear guest speaker Edmund A. Laport, director of communications engineering, Radio Corporation of America, speak on "Tropospheric Scatter Propagation—A Modern Method of Radio Transmission."

After cocktails and dinner, the meeting was called to order by the Chapter President, RAdm. Stanley F. Patten. During the discussion of present chapter affairs, it was moved and approved that a committee be appointed to consider an appropriate annual award as a memorial to the late Colonel Dixon.

The president also announced the appointment of George W. Bailey as chairman of the nominating committee for officers and directors for the year 1957. Other members are to be appointed at a later date.

Commander L. J. Malnati, chairman of the membership committee, presented a report on membership. The present membership is 1,215 and it is estimated by the committee that by the end of this year the membership will reach the 1,250 mark.

After the reports had been heard, members and guests listened to Speaker Laport's lecture, which was illustrated with a series of charts showing the distances that can be covered by tropospheric scatter and the amount of communication reliablity which can be obtained.

Mr. Laport pointed out that the use of tropospheric scattering techniques require the use of high power transmitters in the order of 10 KW output and very large antenna systems, usually of the parabolic type, having diameters of as much as 60 feet. It is essential, he explained further, that the radio beam be tangent to the earth's surface in order to obtain tropospheric scatter.

Mr. Laport also stated that a worldwide survey indicated the possibility of utilizing tropospheric scatter radio stations to almost encircle the world and to provide highly reliable telegraph circuits.

North Carolina

The annual fall banquet of the chapter took place October 3rd at the Highland Country Club in Fayetteville. James Fowler, chairman of the program committee, made the arrangements for this social event.

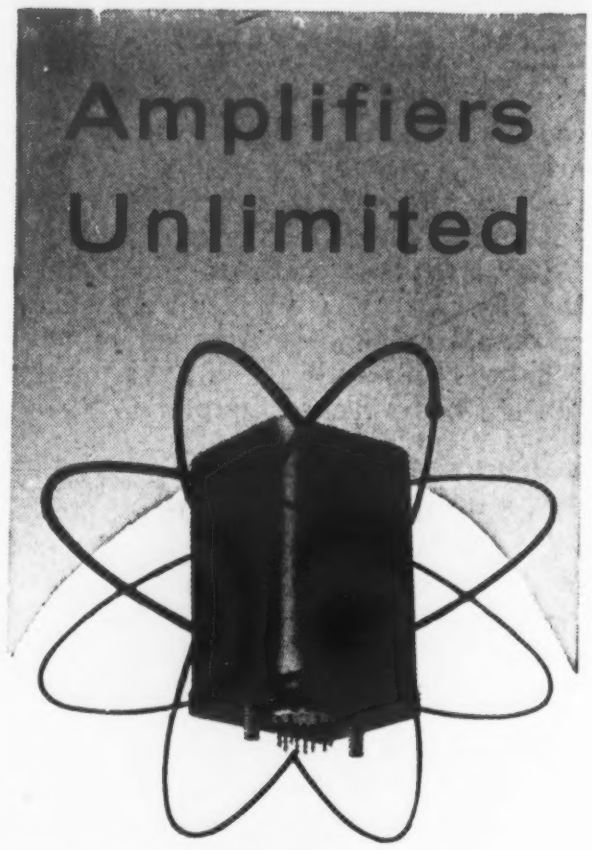
Members from Charlotte, Tarboro, Raleigh, Rocky Mount, New Bern, Fayetteville and Fort Bragg attended the affair.

Chapter officers for 1956-57 are: Col. Henry J. Hort, Signal Officer, 1st Logistical Command, Fort Bragg, honorary president; L. W. Hill, president of North Carolina Telephone & Telegraph Co., president; Joe S. Stone, Southern Bell Telephone & Telegraph Co., 1st vice president; Col. Walter A. Simpson, CONARC Board Number 5, Fort Bragg, 2nd vice president; Capt. Russell G. Watts, 1st Logistical Command, Fort Bragg, secretary, and Theodore P. Williamson, commercial manager, North Carolina Telephone & Telegraph Co., treasurer.

North Texas

Chapter members and guests attended the annual picnic on July 27th at Wylie's Dude Ranch.

After spending the day swimming, boating, riding, and playing games, the



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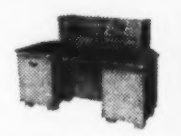
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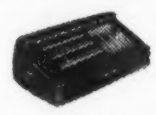
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CHAPTER NEWS

group was served a chuck wagon style barbecue dinner. The dinner was followed by an evening of dancing.

The group met for their next meeting at Camp Bullis, San Antonio, where they observed an Army medical maneuver of a large-scale evacuation of personnel. The meeting was held jointly with the South Texas Chapter.

Philippines

Forty members met at the Manila Air Station Officers Club on August 17th for cocktails, dinner, and to hear two lectures.

The first lecture was by Mr. John Feeloy who covered the history and trends of RCA Communications. Mr. Orin Brecker, who was the second speaker, presented a lecture-demonstration on high-fidelity techniques and equipment.

son on September 27th at the Officers Club, Griffiss Air Force Base.

Howard S. Gleason, manager of the automation department of Stromberg-Carlson Co., discussed the subject and also showed a film illustrating some of the automatic processes used by his firm.

A short business meeting took place and committee chairmen for the 1956-57 season were appointed by Robert A. Rodriguez, president. They are: Harry A. Carlson, reserve activities; Richard C. Benoit, Jr., publicity; Harold J. Crowley, arrangements; Albert D. Reisenberg, financial, and Edward B. Darnall, membership.

San Francisco

The September meeting of the San Francisco Chapter was held at Davis, California. Here, the Army Signal Corps recently activated its first fully automatic teletype relay station operating in the Army Command and Administrative Network.

Colonel Cerwin, Signal Officer, and Major Knoeller, Commander of the installation at Davis, were hosts to some 90 members and guests, most of whom came to Davis in Army buses. To save time and to add to the congeniality of the two-hour bus trip, the group enjoyed a box luncheon en route.

The guided tour through the relay station included a visit to the buildings on the site. Small groups were given a firsthand opportunity to watch the operation of the teletype equipment and the automatic message routing and storing units. The groups were also given an opportunity to inspect several radio transmitters, some of which link the overseas stations into the global ACAN Network.

Scott-St. Louis

"Superhighways For Your Voice," an illustrated and demonstrated talk by Mr. Irvin Mattick, Public Information Supervisor, Southwestern Bell Telephone Company, was the highlight of the chapter's September 7th program.

Some forty-eight members and guests attended the dinner meeting to hear the fourth in a series of lectures presented to the chapter by Mr. Mattick. In this talk, Mr. Mattick spoke on long distance dialing, and the transistor's part in automatic selection of long distance routes.

On October 5th, more than forty members and guests took a tour of the bottling plant of Anheuser-Busch, Inc., St. Louis.

After the tour, the group was shown the company's film, "One Above All," which showed the complete operations of the largest brewery in the world, Anheuser-Busch.

Seattle

Members and guests met at the Elks Club for dinner and to hear Mr. Williams of the Pacific Tel. & Tel. Co. speak on the history of the telephone on September 12th.

The Naval Air Station was the scene of a recent meeting of the Louisiana Chapter. Pictured left to right: Bruce Hay, secretary; W. Perry Craddock; C. C. Walther, past president; LCdr Delmar L. Canady, Aviation Technical Training Officer, Naval Air Station; Charles Pearson, Jr., president; Capt. H. W. Stinchcomb, Commanding Officer, 8th Ccast Guard District; Capt. E. W. Green, Communications Div., New Orleans Army Terminal; Dr. W. P. Gardiner, Board of Health, City of New Orleans; Paul Cordes, chairman, arrangements committee.

Pittsburgh

Fresh air was the order of the day. when chapter members and guests met at South Park on September 20th for a real old-fashioned picnic.

Golf, horse back riding, horse shoes, and card games were featured at this get acquainted gathering. Valuable door prizes, added attractions, were won by the holders of lucky tickets.

Rocky Mountain

During the summer, chapter members met on two occasions. The first meeting was a dinner meeting at which George Kensler of Deits Brothers, Colorado Springs, gave a demonstration of high fidelity stereophonic sound. The second summer meeting was an outdoor picnic.

Rome-Utica

Chapter members learned about new trends in automatic manufacturing techniques at their first meeting of the sea-

In his speech, Mr. Williams traced the development of telephone communications from the original simple networks of direct lines between subscribers, through the various stages of switching systems, to the present-day development of customer direct distance dialing.

South Texas

The Fourth Army Annex, Fort Sam Houston Officers Club, was the scene of the chapter's September dinner meeting and the topic of the evening was "Some Aspects of Research and Development."

Sixty members and visitors heard the noted expert, Maj. General Harry Reichelderfer, Deputy Army Commander, Fourth Army, relate vital information on the subject.

General Reichelderfer has played an active part in research and development since 1922. He is a former Commanding General of the Signal Corps Engineering Laboratories, Fort Monmouth, New Jersey, the laboratories

On September 27th the San Francisco Chapter visited the Signal Corps' first fully automatic teletype relay station operating in the Army Command and Administrative Network. Above, members look on while a guide explains the functions of equipment in the transmitter building at the ACAN Primary Communication Station located in Davis, Calif.

which are responsible for all communications research and development within the Army.

Southern California

Maj. Gen. Francis L. Ankenbrandt, Director of Communications-Electronics, Joint Chiefs of Staff, addressed the chapter's June 12th meeting.

He described the operation and some of the problems of the JCEC. Among the topics discussed were frequency assignments, frequency spectrum analysis, communications procedures, communications circuits, navigational aids and electronic counter-measures. He also touched on the role of the JCEC in supporting NATO and speculated on its ability to support NATO in any new role that might come about in due course as emphasis within that organization tends to change from purely military to more political and economical.

The Board of Directors of the Southern California Chapter met with the Professional Group, Military Electronics, of the Los Angeles Chapter of IRE at a luncheon on August 20th in Los Angeles.

Among those present at the meeting were George Bailey, Executive Secretary of IRE and past national president of AFCEA, Dr. W. R. G. Baker, National AFCEA Director, Capt. Chris Engelman, USN, Adm. Charles F. Horne of Convair, Capt. D. P. Tucker, USN, and John F. Byrne, resident manager of Motorola.

This meeting was arranged by M. D. McFarlane of Robert Shaw Fulton Co.

The chapter had its October 2nd meeting at the Town House Hotel. Approximately 65 members attended.

Speaker of the evening was Adm. John B. Pearson, Naval Bureau of Aeronautics, Western Pacific Division. The topic of his speech was the "Role of the United States Navy Today."

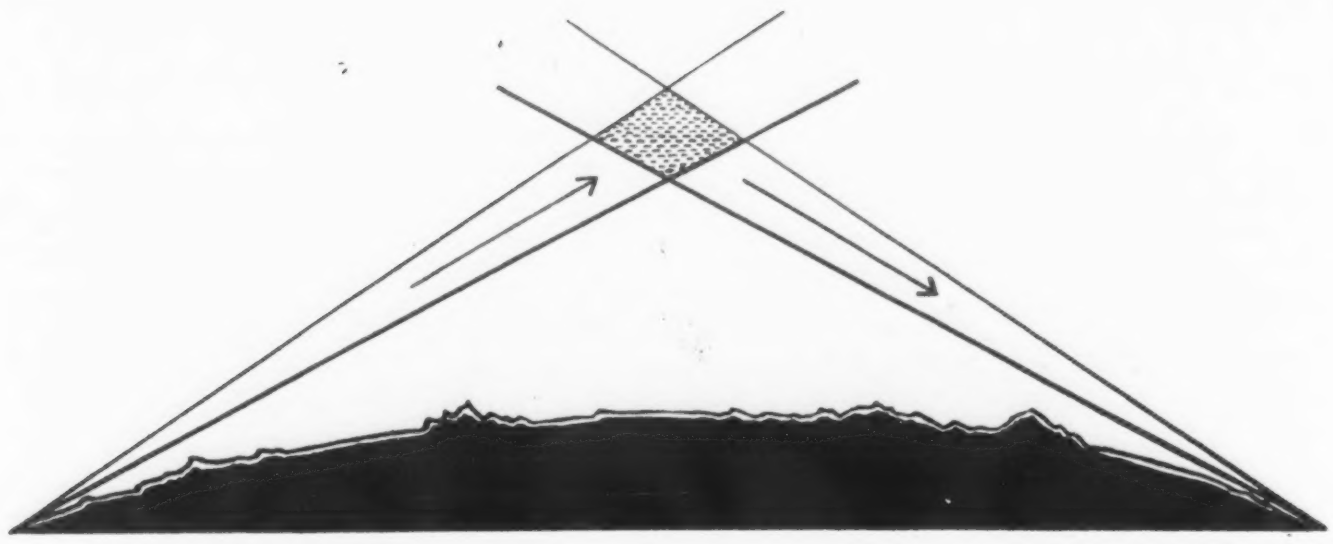
Tinker-Oklahoma

Forty-seven members and guests attended the chapter's first meeting of the season at the Tinker Air Force Base Officers Club on September 21st.

The meeting was called to order by the chapter president, Loyd G. Dorsett. Mr. Dorsett announced that Col. J. Francis Taylor, Commander of the 1800th AACS Wing has been appointed to be a director, replacing Col. Samuel A. Mundell, who has been transferred to Wright-Patterson Air Force Base.

Jack W. Grewell reported on the progress of the scholarship committtee. He explained that he was sending a questionnaire to each member concerning his specialty. During the coming year, he plans to have the different members visit the high schools in this area and tell the students about their work. It is planned to award a scholarship to a student majoring in science.

Southern California Chapter's June meeting was addressed by Maj. Gen. Francis L. Ankenbrandt, Director of Communications-Electronics, Joint Chiefs of Staff. Shown, left to right, are: Adm. John B. Pearson, NavBuAer; William J. Halligan, past national president, AFCEA; Charles A. LaHar, chapter president; General Ankenbrandt; and Adm. Charles F. Horne, chapter director.



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CHAPTER NEWS

The principal speaker of the evening was Col. Lewis G. Young, Director of Communications-Electronics of the 33rd Air Division. Colonel Young gave an interesting talk on SAGE. He pointed out that SAGE was built around the long-standing principles of air defense: detection, identification, interception, and destruction. At the conclusion of his remarks, he called on Fred W. Coble to present a film on SAGE, prepared by the Massachusetts Institute of Technology.

To conclude the evening's program, Mr. Dorsett gave a very fine demonstration of some closed-circuit television equipment.

Washington

Celebrating its tenth anniversary, the chapter had a special luncheon meeting at the Willard Hotel on September 28th. Its distinguished guest speaker was the Honorable Charles C. Finucane, Undersecretary of the Army, who spoke on the "Contributions Made Through Industrial-Military Affiliations."

In his speech, Mr. Finucane stated: "The bond of unity between the Military Services and the electronics-communications industry is responsible for the great progress made in the field of military electronics during the last ten years.

". . . . During this period, the Army recognized the potential of new weapons such as guided missiles and the dependence of these advanced weapons upon electronics and communications in the Army of the future, the Atomic Army.

". . . . Today, notwithstanding our country's numerous technical accomplishments, we face new and important challenges hardly dreamed of a decade ago. We know we must continue to use the most advanced scientific achievements and that their proper use will require a flexible organization.

". . . . The ability of the Army to carry out its vital mission as a member of the Defense Team is one of the most important measures of our national security. It must be capable of supporting our national policy in all international situations.

Charles C. Finucane, Undersecretary of the Army, principal speaker at the September 28th meeting of the Washington Chapter.

"We have made great strides in the area of communications and electronics to provide for improved capabilities of our Armed Forces. But, there remains a great deal yet to be accomplished. Perhaps the most significant of all is the exploitation of electronic means for target acquisition or battle area surveillance. Radar is one of the most promising means known today for such purpose, and deserves even greater attention. It is a must for our Army of the future.

". . . . Not to be overlooked is the new requirement for modernizing our world-wide communication system, and continuing to improve other communication facilities.

". . . . I do appreciate, as I am sure you do also, the need for firepower and mobility in warfare. I also understand that in addition to firepower and mobility we must have leaders of superior quality and means by which these leaders can obtain necessary information and then direct and control their forces.

"This is why I maintain," Mr. Finucane concluded, "that communications and electronics are essential to modern military forces. Many great advances are still required in this area, and, by a conservative estimation, during the next ten years the Army will experience a growth and development in its use of electronics and communications which will be comparable to—and may exceed—industrial growth during the same period. This will place a further stress on the capabilities of the electronics and communications industries, and will require an even closer partnership by the military with industry. I am sure the Armed Forces Communications-Electronics Association will do all it can to maintain and strengthen this partnership."

More than 350 members and guests turned out to honor the Association as it marked its tenth year. Among the chapter's distinguished guests were: Lt. Gen. C. B. Magruder, USA, Deputy Chief of Staff, Logistics; Lt. Gen. E. L. Cummings, USA, Chief of Ordnance; Maj. Gen. J. D. O'Connell, USA, Chief Signal Officer; Maj. Gen. G. I. Back, USA, (Ret.), Chief Signal Officer from 1951 to 1955; Maj. Gen. S. B. Akin, USA, (Ret.), Chief Signal Officer from 1947 to 1951; Maj. Gen. H. C. Ingles, USA, (Ret.), Chief Signal Officer from 1943 to 1947; Brig. Gen. E. A. Brown, Jr., USA, Deputy Chief of Public Information; Brig. Gen. J. P. Daley, USA, Director, Special Weapons, R & D; Brig. Gen. A. L. Pachynski, USAF, Director, Communications & Electronics; RAdm. H. C. Bruton, USN, Director, Naval Communications; Col. Kenneth M. Sowers, USA, Comptroller, Chief of Chaplains; Lt. Col. S. P. Hidalgo, USA, Military Assistant to Secretary; A. J. Falk, Deputy Director, Communications Division, BDSA, Department of Commerce; Dr. E. G. Witting, Deputy Director, R & D, United States Army, and Percy G. Black, National President, AFCEA.

Head table at Southern California Chapter's October 2nd meeting. Left to right: David Callahan, Richard Fuller, past president; Robert Vaughan, vice president; Admiral John B. Pearson, Naval Bureau of Aeronautics, Western Pacific Division, principal speaker; Charles A. LaHar, president; Lester Daniels, vice president; General of the Army Omar N. Bradley; Jack Warner, Jr., secretary; John W. Inwood, director.

ITEMS OF INTEREST
From Government, Industry and the Services

Sound Waves Clean Surgical Tools

The Pioneer Central division of Bendix Aviation Corporation has devised a unique method for cleaning surgical tools in hospitals. 90,000 instruments are soiled annually in the average hospital operating room, and Bendix's ultrasonic cleaner is expected to eliminate elbow grease and expensive chemicals from this chore, replacing them with sound waves and cold water.

The cleaning unit will reduce cleaning cost and time by nine tenths. It contains a generator and "cold boils" water with high-frequency sound, forcing the water under the material on instruments at a pressure equivalent to 2½ tons per square inch.

Pictured at the left is the new Signal Corps Optical Tracker. Developed at Fort Monmouth, N. J., it can trace a moving plane 300 miles away in natural color on its scope through a powerful, 160-inch lens. The revolving equipment, weighing 1½ tons, is designed to operate with radar sets.

AT&T Transatlantic Cable

A new transatlantic telephone cable system, the first voice link to be established between North America and Europe, has been opened to public service. In the initial call, Mr. Cleo F. Craig, chairman of the Board of Directors of the American Telephone & Telegraph Company, exchanged greetings with Dr. Charles Hill, head of the British Post Office, who spoke from London. The conversation had the clarity and naturalness of a neighborhood call.

The cable system, under construction for more than two years, is not only the first of its kind to cross the Atlantic, but the first underwater phone link to span any ocean. AT&T, the BPO, and Canadian Overseas Telecommunication Corporation are partners in the enterprise. The system can carry 36 conversations at the same time. Thus, it is able to handle about three times the traffic now transmitted between this continent and Great Britain by radiotelephone.

The deep-sea segment of the system extends 2,250 miles from the east coast of Newfoundland to Scotland. New trunk lines link the system to switchboards in London. In the United States, lines link the system to the established American and Canadian networks.

The particular problem that had to be overcome was the development of an underwater amplifier, or "repeater," an electrical device that would boost voice signals after they had reached the fading point along a circuit. While repeaters are relatively easy to install and maintain along land cable, the undersea cable demanded an amplifier that could be built into the cable in such a way as to be able to pass easily through a ship's laying gear without interruption; withstand pressures of at least 6,000 pounds per square inch; and operate without attention for at least 20 years. Bell Telephone Laboratories perfected such a repeater. To keep signals constant and clear. 51 repeaters, spaced about 40 miles apart, are located in each cable.

Latin American Aviation Conference

The first meeting of both civilian and military aviation officials from the United States and Latin America to discuss present and future inter-American aviation activities and requirements is scheduled for November 14 through 16 in Miami, Fla. Sponsor is the Export Committee of the Aircraft Industries Association.

Since Latin America is unusually dependent upon air transportation, and the U. S. is its prime source of supply for equipment, the meeting will give those nations a unique opportunity to present their aviation problems and suggest solutions.

After a general session for orientation and introductions, the three-day program will open with presentations by the Latin Americans of their present and foreseeable future requirements for civil and military aircraft. The second session will be devoted to a discussion of export-import problems, with a discussion of sources of financing, terms and conditions, and methods of payment by leading U. S. financiers scheduled for the final day.

Supersonic Attack Weapon for Navy

An $86,000,000 contract for research and development of a supersonic attack weapon, designated the A3J, has been awarded the Columbus Division of North American Aviation, Inc., by the Navy.

Described as a high-supersonic, carrier-based attack aircraft weapons system, the two-place twin jet was conceived and designed in Columbus. The A3J is described as a "weapons system" rather than an aircraft because of the manufacturer's integration of equipment systems—a departure from the usual building of aircraft to accept existing prepackaged components.

They used to remove a section of the deck to get a radar switchboard inside a submarine. Now it fits easily through a hatch because Admiral has redesigned the unit to reduce bulk and weight by as much as two-thirds!

This priceless saving in pounds and inches is only one of the new unit's many advantages. Formerly up to 400 man-*hours* were needed for major repairs such as replacing a defective switch section. Now the job is done in 20 *minutes!* The entire unit is built up of standardized sub-assemblies fitted with multiple connector plugs. It is a simple matter to remove and replace a faulty switch or amplifier. Each switch section even has its individual power supply to keep the switchboard operable in case one section goes out. The unit can be readily expanded to handle additional radar indicators by simply adding more self-contained sections. Printed switches and circuit boards, designed for automation assembly, are ruggedly resistant to vibration and humidity.

The radar switchboard, for use on all types of naval vessels, is typical of Admiral's advanced design, research and development in electronics, now being carried forward for all branches of the Armed Services.

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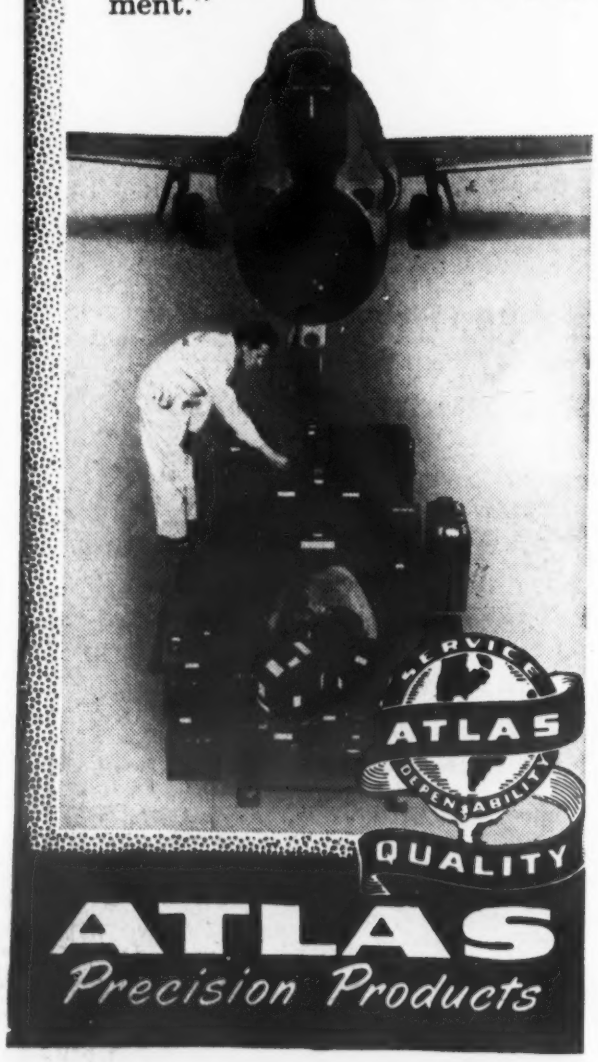
ATLAS Precisioneers "HUSH-HUSH" Assemblies for THE FALCON

● NO HIDING place "upstairs" for enemy bombers with *The Falcon* on the hunt. This newest guided missile is being produced for the U. S. Air Force by Hughes Aircraft Company.

Some of the "innards" of this bird of prey are ATLAS-Precisioneered and classified "confidential." But there's no secret as to how ATLAS can help you develop parts and assemblies from pilot stage to production efficiency for radar . . . sonar systems . . . computers . . . correctors . . . all types of electro-mechanical devices. Just bring your designs to ATLAS. At your disposal *on a job* basis are our men, equipment, techniques; a prototype is turned over to you for volume production.

When war or peace demands a product, call on ATLAS Precision Products Co. (div. of Prudential Industries), Philadelphia 24, Pa.

Send for booklet, "Precisioneering Electro-mechanical Equipment."



ITEMS OF INTEREST

Hypersensitive Dye

Synthesis of a new dye that has its absorption maximum at what is believed to be the farthest point yet reached in the infrared has been reported by Eastman Kodak. The new dye is of the cyanine group.

It is from this group that scientists have selected "spectral sensitizers" that, when added to photographic emulsions, make them sensitive to additional regions of the spectrum. The dye is known as thiahexacarbocyanine.

Electronic Reservations

Trans World Airlines will install the first coast-to-coast electronic reservations network to be used by any airline. The system will use three magnetic drum centers at New York, Chicago, and Los Angeles to store space availability information on all TWA flights over 35,000 miles of routes.

Teleregister Corporation designed the system which will keep track of space availability on all domestic flights for 31 days and up to six months in advance for overseas flights.

New Guided Missile

A new guided missile, the Lacrosse, has been developed by Cornell Aeronautical Laboratory, Inc., and is being produced by the Glenn L. Martin Co., the Army recently revealed. It is a surface-to-surface guided missile for close support operation on the battlefield.

The Army has stated that in the development of the Lacrosse, emphasis has been placed on accuracy and mobility. The Lacrosse has been described as a deadly accurate weapon system, and test firings in New Mexico have proved to be successful.

The essential components in the system are the missile, a launcher mounted on a standard Army truck, and a guidance station.

Ultrasonic Metal Testing

Now available from the Curtiss-Wright Corp., Woodridge, N. J., is a low cost, packaged unit for ultrasonic, non-destructive metal testing. The unit utilizes the Curtiss-Wright Immerscope as the nerve of the system.

The portable "package," Model PT1001, was designed for stabilizing high-quality control standards while lowering inspection costs, and consists of the Immerscope, a four-foot immersion tank, a search tube and rack, a precision manual manipulator, a longitudinal and transverse manual scanning mechanism, and a complement of crystals.

In operation, metal parts to be inspected are placed in the partly water-filled tank, and ultrasound transmitted by the search tube and crystal penetrates them. Defects are shown as reflection, or echo, "pips" on the Immerscope screen. The exact position of the defect can then be determined by using the precision manual manipulator.

Mars Station at Ft. Worth

A Military Affiliate Radio System (MARS) station AA5WCJ, which could provide emergency communications between Ft. Worth and other parts of the country, is now in operation at the Ft. Worth General Depot. It will be manned after duty hours by depot employees who hold ham licenses.

Designed to create interest and further training in military communications, the new short wave station will be in contact with MARS units at other defense installations during regular weekly drills.

Operating on 500 watts power, the station is equipped with two BC-610 transmitters with BC-799 receivers and two BC-614 speech amplifiers. Antennas are all wave center feed zep flat top with tuned line feeder 600 ohms impedance, and a 20 meter rotary beam on a 54-foot triangular steel tower. Auxiliary emergency supply is a PE-197 3.5 KW.

Program Set For '56 Computer Conference

The 1956 Eastern Joint Computer Conference, which will meet December 10-12 at the Hotel New Yorker and Manhattan Center in New York City, has announced that some 28 technical papers will be presented by the foremost computer authorities. Leading manufacturers of computers and associated products will exhibit their equipment to an anticipated record attendance of engineers and management executives.

Among those companies already listed for exhibits at the conference are: American Telephone & Telegraph, Bendix Aviation, Burroughs Corp., Electronic Assoeiates, Hughes Aircraft, New York Telephone Co.,

Remington Rand, and Sprague Electric Co.

The three societies sponsoring the conference are the Institute of Radio Engineers, American Institute of Electrical Engineers, and the Association for Computing Machinery.

Safety Via Electronics

Electronic devices someday may be used to determine more accurately the safety of mine roofs and thus lessen the chances of roof-fall accidents, the leading cause of coal-mine fatalities. For many years, miners have tested roof by striking it with various instruments. The safe condition of a roof is then determined by the type of vibration heard. There are always variations in the abilities of miners to test roof properly.

More than 300 electronic recordings have been made of vibrations in a series of experiments conducted in a Dehue, W. Va., coal mine. These records have been analyzed and the data correlated with data contributed by individual miners testing the roofs in the same areas. In general, the findings compare favorably. In borderline cases, electronic findings were less conclusive than the reports of experienced roof testers examining the same areas. The results, however, have been encouraging enough to indicate that equipment and methods capable of positive findings ultimately will be developed.

ASESA Testing Program to Expand

In view of a continuing and increasing need for qualified suppliers of electronic and electric parts, the Armed Services Electro-Standards Agency, Fort Monmouth, New Jersey, is expanding its Qualification-Testing Program.

To supplement Government testing laboratories, the ASESA recently inaugurated an extensive program providing for qualification testing of electronic and electric parts in commercial testing laboratories and in the plants of parts manufacturers. This program has been so effective that it is now desired to enlarge its scope by permitting qualification testing in the plants of electronic equipment manufacturers.

Equipment manufacturers who feel that their facilities are adequate for such testing and who desire additional information on this program, are encouraged to contact the Director, Armed Services Electro-Standards Agency (ASESA), Fort Mon-

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mouth, New Jersey.

Likewise, commercial testing laboratories and parts manufacturers, who are unfamiliar with the ASESA's program for qualification testing in other than Government laboratories, are also encouraged to contact the ASESA.

Air-to-Ground Loudspeaker System

More effective than any previous airborne system, an air-to-ground loudspeaker system capable of being dropped from aircraft at altitudes up to 60,000 feet has been developed by the Cook Research Laboratories of the Illinois Institute of Technology, under the sponsorship of the Communication and Navigation Laboratory of the Wright Air Development Center.

Consisting of a lightweight magnetic tape playback unit, a 500-watt battery powered audio amplifier and horn assembly, a pressure initiated control system, and a three-stage parachute arrangement, the device is housed in a three part, separable, bomb-shaped container weighing 850 pounds. It is designed to deliver a 3- to 5-minute tape recorded message to the ground during a parachute-braked final phase of its descent.

Paraballoon Antenna

Newest contribution to national defense is a mobile radar set, utilizing two paraboloids in its antenna, developed for the U. S. Air Force by the Westinghouse Electric Corp., Pittsburgh, Pa.

Called the Paraballoon antenna, the radar will be used to detect high-flying aircraft. Key development is the use of two paraboloids—one of which is coated on the inside with vaporized aluminum to form the radar reflector — joined at their rims and inflated.

An air-supported radome—lightweight, sectionalized and designed to erect directly on the ground— protects the radar and electronic equipment, operating personnel, and the Paraballoon antenna from high winds and ice loads. Within the radome, the antenna is supported in an upright position on a collapsible magnesium base by a difference in air pressure. The radome itself can be dismantled in a few minutes and packed into shipping containers weighing about 200 lbs. each.

G-E HIGH-TEMPERATURE COMPONENTS

The development of engines powerful enough to push a plane or missile beyond the speed of sound has also created speeds which cause aerodynamic or friction heating to temperatures far in excess of those found in the past. This has resulted in a large jump in temperature environment, instead of a steady progression. In addition, the development of nuclear power plants has added a new environment, that of nuclear radiation, bits of matter and energy emitted at terrific speeds which damage or cause improper operation of many present-day components.

These major jumps in environmental conditions (that is, the temperature, vibration, humidity, etc.), called for major jumps in components' tolerance for the environment. The equipment or material required to protect them is too heavy or simply not capable of doing the job. The feasibility of attaining the necessary big step in component tolerance was demonstrated recently by the General Electric Company at a press conference in New York City.

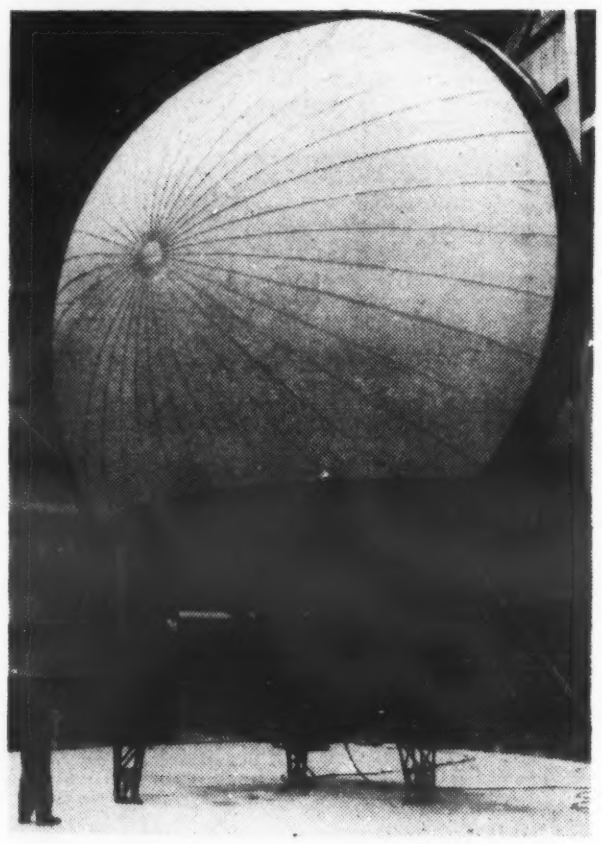
The penetration of a critical temperature barrier in the development of guided missiles and supersonic aircraft was dramatically shown with laboratory models of revolutionary electronic devices and circuits operating literally "red hot." This achievement is a major step toward overcoming the inability of electronic controls to withstand the skin-sizzling heat generated by air friction at extreme speeds. An equally important "plus" feature of the new electronic circuits is their ability to operate for long periods while exposed to intense nuclear radiation in an atomic reactor.

Inside glowing electric furnaces and surrounded by blazing blowtorches, General Electric's new vacuum tubes, capacitors, resistors, transformers, inductors, wires, printed circuit boards—and even an electric motor—were operated at temperatures ranging from 900 to 1500 degrees Fahrenheit. Metals such as titanium and special laboratory-designed ceramics play important roles in the design and construction of high-temperature components. The performance of high-temperature components compares favorably with previous devices that would operate only at low temperatures.

Communications For Olympic Games

Four years of advance planning will be climaxed in November and December when nearly 100 communications channels will be concentrated on disseminating the Olympic Games story from Australia to the rest of the world.

Displayed below is the Westinghouse Electric Corp.'s Paraballoon Antenna, a mobile radar set designed for tactical air defense.



Extensive Australian domestic communications facilities, including 5,000 telephones, with more than 2,000 special telephone terminals and numerous switchboards, will also be provided for the event. The coordination of all communications facilities will be directed by a Communications & Broadcasting Committee. headed by Assistant Director General of Telecommunications, M. R. C. Stradwick of the Postmaster General's Department. The Overseas Telecommunications Commission (Australia), the Australian Broadcasting Commission, and the Australian Federation of Commercial Broadcasting Stations are represented on the committee.

The General Manager of the Australian OTC is Trevor A. Housley. He has been responsible for extensive radio and general telecommunications installations, and throughout the war years he controlled large works in the Pacific area and organized radar installations for naval authorities. With the OTC, he has been in charge of the arrangements for handling the vast volume of overseas telephone, telegraph, and photo-telegram traffic anticipated for the Olympic Games this year.

The Olympic Games, scheduled for

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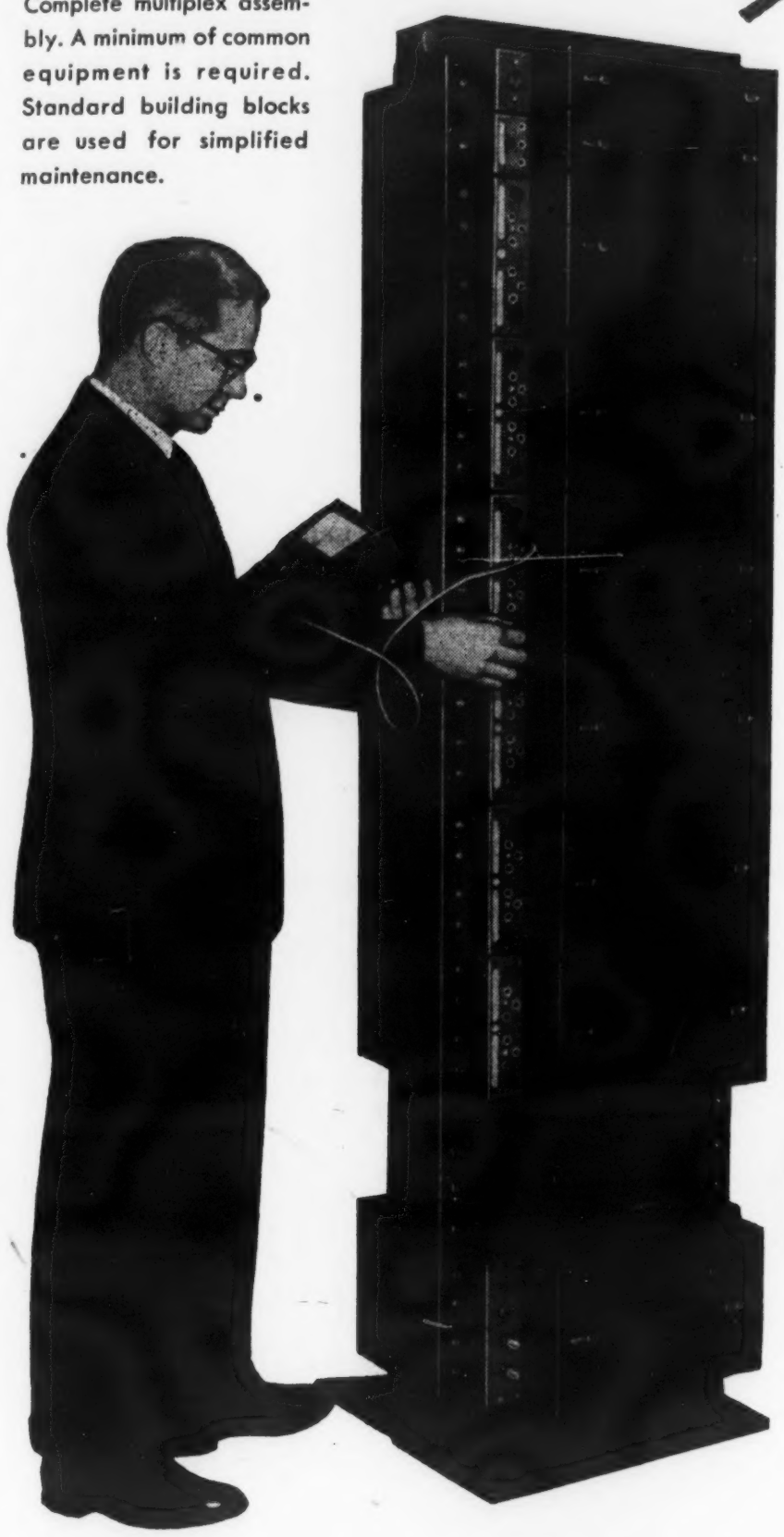
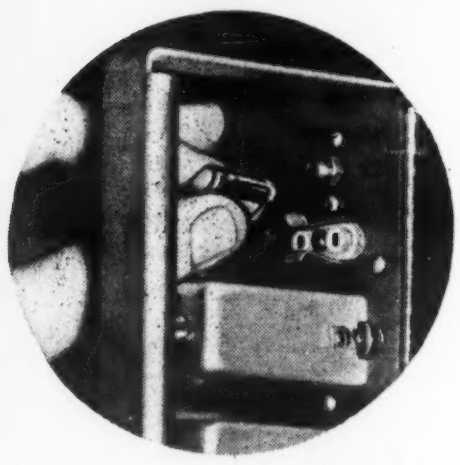
Complete multiplex assembly. A minimum of common equipment is required. Standard building blocks are used for simplified maintenance.



New RCA Type MV-124 with All Channel Units Identical and Interchangeable

Specifically designed for microwave use and thoroughly field tested, this new RCA Channeling Equipment provides complete flexibility. Frequency selection is by means of a plug-in crystal. Except for this crystal, *all Channel Units are identical and interchangeable*, thus simplifying planning, installation and maintenance.

Whatever your channeling requirements, these famous quality Channel Units can be easily stacked to provide two channels, three channels, or up to 24 voice channels without group modulating. High capacity systems can be obtained by stacking 24 channel groups. One unit is required for each voice channel desired. Single sideband suppressed carrier techniques are used to supply 24 channels in the band between 10 kc and 130 kc frequency, leaving frequency space for 18 tone channels below 10 kc. Simultaneous transmission of many channels of intelligence is accomplished by modulating separate sub-carriers spaced uniformly throughout the base-band modulating system. Channels are spaced one above the other in the available modulating band width.



To change channel assignment, simply change one plug-in crystal.

CRYSTAL CONTROL assures high stability and greater accuracy. For operations such as frequency shift telegraph and facsimile transmissions, an unusually high degree of clarity is attained.

DOUBLE HETERODYNING enables all circuits in all units to be identical except for the plug-in crystal element.

SINGLE SIDEBAND OPERATION enables each channel to use a minimum of spectrum space. This means less obsolescence due to possible congestion of the available microwave spectrum.

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RCA Microwave Specialists will be glad to answer any questions and help plan your installation. Nation-wide services of the RCA Service Company are provided to keep entire system operating at its peak. Mail coupon for further particulars.

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ITEMS OF INTEREST

Nov. 22-Dec. 8 in Melbourne, present a unique problem in long-range telecommunications, since other recent Olympic sites have been in countries which had nearby neighbors with well established communications channels. Because of its location, Australia is dependent on submarine cables and radio circuits, including some of the longest and most difficult in international use.

Training Restrictions Lifted for Army Reserve Units

Under a recent change in Army policy, men in the 17 to 18½ years age group who enlist under the Reserve Forces Act of 1955 may now apply for any MOS vacancy within a given unit regardless of the length of service school training required to obtain MOS proficiency.

Thus, if a man enlists in a Signal Corps reserve unit as a Field Radio Repairman, he can complete his 8 weeks basic combat training, then spend approximately 14 weeks at a Radio Repairman Course at Ft. Gordon or Ft. Monmouth. His 6 months active duty completed, he returns to his unit, and may apply for active duty at either of the above posts to complete the full 25 weeks course if his unit cannot completely train him.

The program could be of benefit to a communications or electronics company employing a high school graduate. Should the company encourage the young man to enlist for 6 months' active duty in a Signal Corps unit in a particular MOS which the company needs, the individual's skill would have been developed to a high degree—making him eligible for a higher level of work upon reemployment.

AEC Owns Largest Ultrasonic System

An ultrasonic cleaning and degreasing system, considered to be the largest and most powerful of its kind anywhere in the world to date, has been delivered to an Atomic Energy facility by Acoustica Associates, Inc., Glenwood Landing, N. Y.

High-frequency generators totaling 20 Kilowatts will supply power for energizing hundreds of above-audible sound generating transducers needed to irradiate materials being processed en masse. The scrubbing action of the ultrasonically agitated solution flushes impurities from the entire surface of the materials, enabling critically important parts to be microscopically cleaned in a fraction of the time required by conventional means.

Counter Missile Weapon

The latest advancement in the development of Army missiles is an anti-missile missile. Lt. Col. Woodrow B. Sigley, chief of the Air Defense Branch of the Army's missile division, has revealed that the Army believes that its counter missile weapon will be ready to meet any threat of long-range missiles by 1960 or 1961. The new weapon will probably be known as the Nike II and will be a ground-to-air missile.

Automatic Dialing Device

A small, electro-mechanical apparatus for the automatic dialing of telephone numbers was displayed at a recent U. S. Independent Telephone convention. Known as the Dialaphone, and designed and manufactured by the James Kilburg Corporation, San Mateo, California, the new dialing device is used alongside a standard handset telephone and is about tht same size. Automatic Electric Sales Corporation of Chicago is distributor for the Dialaphone to independent telephone companies.

The Dialaphone saves the user the trouble of dialing frequently called telephone numbers. Names and telephone numbers up to a capacity of 850 can be placed on a coded, tape-like "directory" operated by a small hand crank. A name and number are quickly located by means of an alphabetical finder. To make a call, the tape is turned to place the desired name in a viewing frame, and as soon as a button is pressed, the number is automatically dialed.

Names and numbers can be placed on the tape at the factory, or the user can make the entries himself. The directory is expendable and easily replaced, thus providing for complete change of directory in any machine.

It is anticipated that the Dialaphone will grow in popularity as direct distance dialing, which necessitates dialing 10 or more digits, comes into widespread use.

The Dialaphone may be used with the loudspeaking, hands-free type of telephone, thus making it possible for a user to complete a telephone call without either dialing or lifting the handset.

Submarine Simulator

An elaborate, new electronic training device, the Universal Submarine Simulator ,has been built at the U. S. Submarine School, Groton, Conn., to give new recruits dockside training. This device was built by the Electric Boat Division of General Dynamics Corp., under contract with the Navy.

Pictured above are submarine trainees in action as they undergo dockside training in the Navy's new electronic Submarine Simulator, recently completed at General Dynamics Corporation's Electric Boat Division.

Submarine reactions are simulated with the trainer from a control room mounted on a hydraulically actuated cradle firmly anchored in concrete. A roomful of electronic computers acts as its engine room, diving planes, ballast system, and "ocean."

A quarter cylinder represents in

fair detail the control room of a submarine, and when staffed by a crew of neophyte submariners, the control room will start up, dive, turn, and climb. At the direction of an instructor, it will run into rough weather, fire torpedoes, develop a leak or engine failure, or simulate other emergencies.

The machine is accurate even to the "feel" of controls as they are manipulated. By adjustment of its computer system, the simulator can be made to duplicate the control characteristics of all the various types of submarines now in use, plus a few which are still on the drawing boards.

Personnel

McDonald Named To New Post At Kellogg

Henry J. McDonald, vice president and director of the Chicago Chapter of the AFCEA, has been named secretary and general counsel of Kellogg Switchboard and Supply Co., a division of the International Telephone and Telegraph Corp.

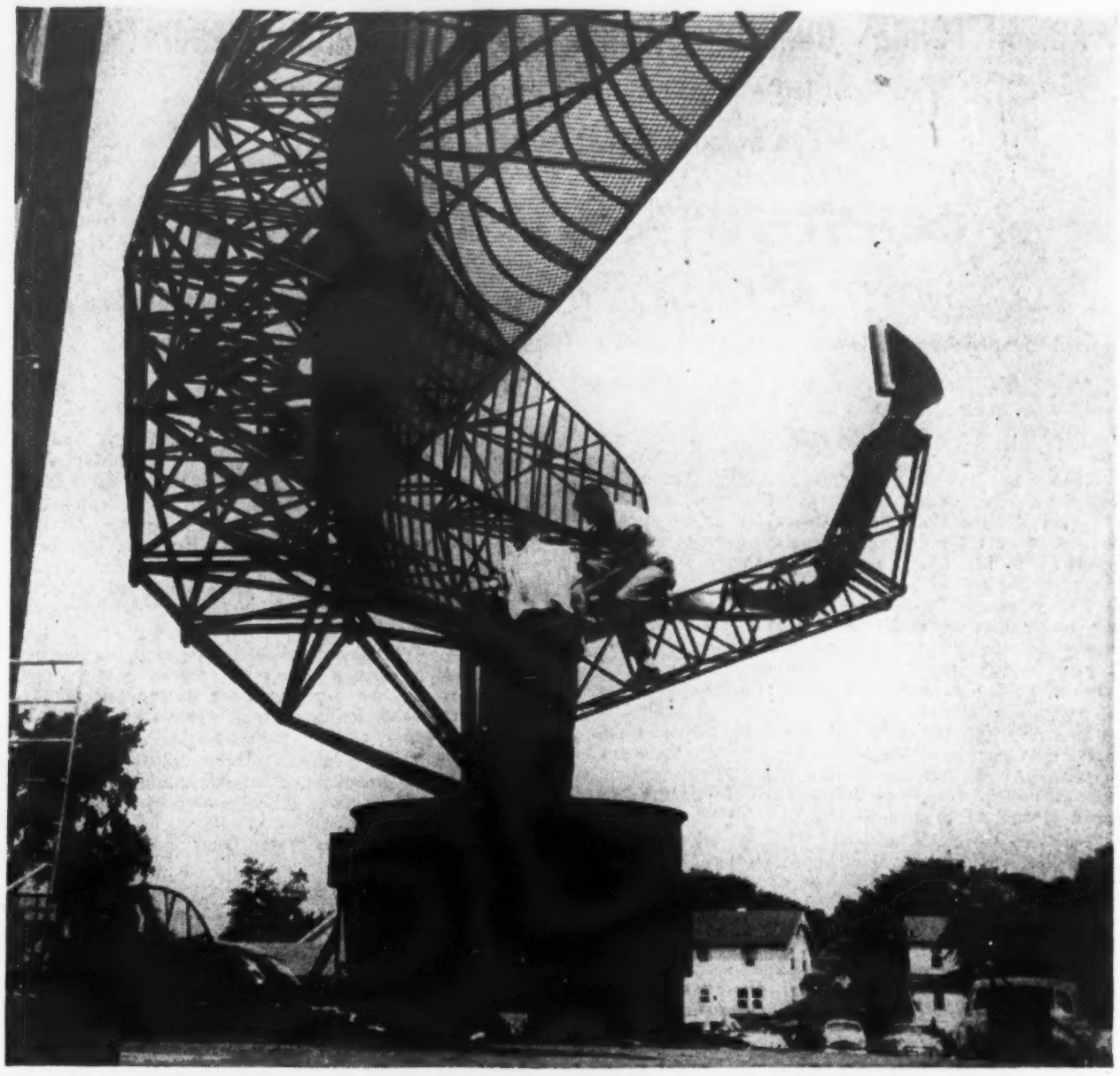
Mr. McDonald, formerly assistant secretary and assistant treasurer, will retain the latter position in addition to his new responsibilities. As general counsel, he will have charge of Kellogg's newly created Law Department which combines the activities of both Patent and General Law.

New BDSA Administrator

Horace B. McCoy has been named to succeed Charles F. Honeywell as Business & Defense Services Administrator in the Department of Commerce. Mr. Honeywell's resignation became effective October 15th.

Mr. McCoy's long government career included service during the Korean conflict as an Assistant Administrator of the National Production Authority, in charge of a bureau which had jurisdiction over industrial areas embracing communications and electronics equipment. He became Deputy Administrator of BDSA when functions and personnel of NPA were transferred to that organization in late 1953.

As we go to press, SIGNAL learned of the retirement of Maj. Gen. F. L. Ankenbrandt, USAF. Replacing General Ankenbrandt on December 1, 1956, as Director of Communications and Electronics, Joint Chiefs of Staff, will be RAdm Joseph N. Wenger, USN.



New 40-foot, high-gain search antenna to be used with the AN/TPS-1D Signal Corps radar.

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We are primarily interested in men who have field experience and a degree in Electrical Engineering. However, if you have an extensive electronics background which includes missile, radar or sonar field experience, send in your application. Valuable special training prepares you for your assignments.

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ARMED FORCES COMMUNICATIONS and ELECTRONICS ASSOCIATION

(COMMUNICATIONS—ELECTRONICS—PHOTOGRAPHY)

1624 Eye Street, N.W., Washington 6, D. C.

CONSTITUTION and BY-LAWS

Adopted April 29, 1947. Revised, May 11, 1948—March 28, 1949—May 12, 1950
April 19, 1951—April 24, 1952—May 15, 1953—May 7, 1954—May 20, 1955
May 25, 1956.

PREAMBLE

The Armed Forces Communications and Electronics Association, organized in 1946 and incorporated under the laws of the District of Columbia, is a national society of American citizens working toward national security in the fields of communications, electronics and photography.

The Association endeavors to maintain and improve the cooperation between the Armed Forces and Industry in communications, and in the design, production, maintenance and operation of communication, electronic and photographic equipment in time of peace as well as in time of war.

The principal objective of the Association is an active membership of American citizens to whom the responsibility of training, production, maintenance and operation of this type of equipment falls in time of peace as well as in time of war.

The Association is entirely patriotic and non-sectarian; it has no commercial interests and no political alliances. It is not operated for profit and its income is expended in furthering its aims and purposes. Its elected officers serve without remuneration. All American citizens are eligible to membership.

SIGNAL, the journal of the Association, is published for the purpose of disseminating chapter news and other information of interest and importance to the members.

ARTICLE I

NAME AND LOCATION

Sec. 1. The name of the Association shall be Armed Forces Communications and Electronics Association.

Sec. 2. The executive offices of the Association shall be in the City of Washington, District of Columbia.

ARTICLE II

MEMBERSHIP

Sec. 1. Membership in the Association shall be open to American industrial organizations and to all men and women who are American citizens and who are interested in furthering the objectives of the Association, with honorary and associate memberships offered to certain citizens of foreign countries.

ARTICLE III

CHAPTERS

Sec. 1. Local Chapters of the Association may be established as provided in the By-Laws. The local Chapters will exercise initiative in the carrying out of their responsibilities in the regular scheduling of local meetings, promotion of Association memberships, fostering of cooperation between the Armed Forces and industry, and furthering the national objectives.

ARTICLE IV

GOVERNMENT AND OFFICERS

Sec. 1. The government of the Association shall be vested in the Board of Directors, which may exercise all powers and do all such things as may be exercised or done by the Association, but subject, nevertheless, to the provisions of the statutes of the District of Columbia, the Certificate of Incorporation of the Association, and the Constitution and By-laws of the Association.

Sec. 2. The Board of Directors shall consist of the national President and five Vice Presidents, and 32 Directors at large, the latter to be elected by the Council, each to serve without pay for a term of four years, and divided into four classes of eight members each, one class to retire at the end of the annual meeting each year, or upon the election and qualification of their successors. The Board of Directors shall have the power to fill casual vacancies in its membership and in all national offices of the Association, and to initiate executive measures necessary to achieve the objectives of the Association. The Board shall meet at least once each year, at the same time and place as the annual convention of the Association.

Sec. 3. The officers shall consist of a president, an executive vice president, a first vice president, a second vice president, and such additional number of vice presidents, not to exceed three, as may be authorized by the Board of Directors, a secretary, and a treasurer. With the exception of the executive vice president, secretary, and treasurer, the officers shall serve without pay. All officers (with the exception of the Executive Vice President, the Secretary, and the Treasurer) shall be elected by the Board of Directors at its annual meeting, to take office at the end of the annual meeting at which they are elected, and to serve for a term of one year following their election, or until their successors are elected and qualify.

Sec. 4. The Board of Directors shall at its annual meeting elect a Counsel to serve without pay for a term of one year beginning at the end of the meeting at which he is elected, or until his successor is elected and qualifies.

Sec. 5. The Board of Directors shall appoint an Executive Vice President, a Secretary, and a Treasurer (none of whom shall be a Director), each to serve for a term to be determined by the Board, but not beyond the next annual meeting of the Board, and shall fix the salary for such period.

Sec. 6. Regular Service personnel shall not be eligible to hold a paid national office in the Association while on active duty status.

Sec. 7. The Council of the Association shall consist of the members of the Board of Directors and one representative for each 100 members or fraction thereof in each chapter, provided however that no chapter shall have less than two chapter representatives, elected or appointed by the chapter for a period of one year beginning on April 1st of each year. The national president of the Association, or in his absence the senior vice president present, shall serve as Council chairman.

The functions of the Council shall be to elect the Board of Directors and Honorary Members of the Association, and to make recommendations with reference to any proposed amendments to the Constitution. Chapters shall have power to fill unexpired terms of their Council representatives. The Council shall meet once each year at the time and place of the annual convention of the Association and at the hour designated by the Executive Committee.

Any chapter, by an instrument in writing filed with the Secretary of the Association, may authorize its representative or representatives present at a meeting of the Council to cast the vote or votes of any of its representatives who may be absent. A majority of the Council votes cast shall be necessary for election to the Board of Directors. Members of the Council are eligible to be present at the annual meeting of the Board of Directors and to participate in the discussions, but shall not have the power to vote.

Sec. 8. There shall be an Executive Committee which shall consist of the President, the immediate Past President, and seven other members of the Board, to be elected by the Board of Directors at its annual meeting for a term of one year beginning at the end of the annual meeting at which they are elected. The Counsel and Executive Vice President shall be eligible to attend meetings of the Committee, but shall have no vote unless they have been elected members of the Executive Committee.

The Executive Committee shall meet at least once each quarter, and at the call of the President or of any three of its members. It shall exercise the powers set forth in the Constitution and By-Laws, also the powers of the Board of Directors between meetings of that Board. All actions taken by the Executive Committee shall be ratified by the Board of Directors at its next subsequent meeting. The Executive Committee shall have the power to fill vacancies for unexpired terms. Notice in writing of the time and place of each meeting of the Executive Committee shall be sent to all members of the Committee at least ten (10) days prior to the meeting date.

Sec. 9. Qualification of Directors and others shall be by acceptance within thirty (30) days by the Director or other persons elected or appointed.

Sec. 10. A quorum of the Council shall consist of

ARTICLE V

MEETINGS

Sec. 1. The Association shall hold an annual meeting in the spring of the year at a time and place to be designated by the Executive Committee, which will cause to be prepared a program to include, where possible, the demonstration of such military and industrial communications, electronic and photographic equipment and training as may be authorized.

Sec. 2. Special meetings of the Board of Directors may be called by the President or the Executive Committee or any ten members of the Board of Directors. Notices of such meetings shall be in writing and shall state the time and place of the meeting, and shall be sent to all Directors at least ten days prior to the meeting date.

ARTICLE VI

AMENDMENTS

Sec. 1. Amendments to this Constitution may be proposed by a majority vote of the Board of Directors or of the Executive Committee or upon petition addressed to the President and signed by not less than five percent of the total number of full members.

Sec. 2. Proposed amendments shall be submitted to the Council at any annual or special meeting for discussion and recommendations after which they shall be referred for final action to the Board of Directors, which may adopt them by a majority vote of the Directors present at any duly convened annual or special meeting at which a quorum is present.

BY-LAWS

1. AIMS AND PURPOSES

a. To preserve and foster the spirit of fellowship among former, present and future communications, electronics and photography personnel of Industry and the Armed Forces.

b. To commemorate the services rendered by the communication, electronic and photographic industries and of industrial personnel, and by the military personnel assigned to these activities in the wars in which the United States has been or may become engaged.

c. To promote efficiency in military communications, electronics and photography, especially through better liaison between Industry and the Armed Forces, as well as among the three Services themselves. This will include the maintenance of close relations between civilian scientists, engineers, manufacturers and operating companies and those concerned with similar activities in military, naval and air force communications, electronics and photography.

d. To bring to the attention of the membership through chapter meetings and the Association magazine, the importance of thorough cooperation between Industry and the Armed Forces in the communications, electronics and photographic fields.

e. To encourage adequate military training throughout the Nation, the upbuilding of adequate enlisted, and commissioned National Guard and Reserve forces, and effective industrial preparedness for war, in the fields of communications, electronics and photography.

2. CLASSES OF MEMBERSHIP

a. FULL MEMBERSHIP in the Association shall be open to all American citizens interested in advancing the aims of the Association—especially in communication, electronic and photographic phases thereof. Present and former military personnel and civilians employed in the electronic, photographic and communication industries, will be especially encouraged to become full members.

b. LIFE MEMBERSHIP in the Association shall be open to all men and women who are American citizens and who are interested in promoting the objectives of the Association. Life membership shall continue during the lifetime of the life member and shall expire at his death. It shall not be transferable.

c. STUDENT MEMBERSHIP in the Association shall be open to all men and women who are American citizens and who are students in the service academies and schools, and in civilian colleges and universities.

d. GROUP MEMBERSHIP in the Association shall be open to all firms and companies controlled by American citizens who are interested in promoting the cause of industrial preparedness particularly in connection with communications, electronics and photography, and with research, development, production, manufacture, operation, and supply of communication, electronic and photographic equipment. Group members shall have the privilege of naming ten of their employees or officials who are American citizens for full membership in the Association, and members thus named shall pay no individual dues.

e. HONORARY MEMBERSHIP in the Association may be proposed by at least ten full or life members of the Association and a favorable vote by a majority of the Council voting shall be necessary for election.

Honorary membership shall be extended to all former Chief Signal Officers of the Army and Directors of Naval, Air and Coast Guard Communications, and the Defense Department Directors of Communications as soon as they assume office.

Honorary membership shall be extended to the Chairman of the Joint Chiefs of Staff and to the Chiefs of Staff of the several Services during their tenure of office, and to such other public officials as the Executive Committee may direct.

(*Continued on page 91*)

Honorary membership shall be for life unless otherwise specified at the time of election, provided, however, that the Board of Directors may terminate and cancel the honorary membership of any individual at any time.

Honorary members shall be entitled to all privileges of full membership except as otherwise provided in the Constitution and in these By-laws.

f. FOREIGN ASSOCIATE MEMBERSHIP in the Association shall be open to all men and women who are citizens of those foreign countries where there are officially chartered chapters of the AFCEA and who are recommended by any such local chapter, and to all men and women in the military services of foreign countries who are assigned with, or attached to, any organization, unit or school of the Armed Forces of the United States for duty, liaison, or training. They shall pay the same dues as full members of the Association, and shall be entitled to all privileges of full membership except the right to vote or to hold office, or to attend meetings at which classified information is to be discussed or classified material displayed.

Foreign associate group members may be enrolled in the Association under same conditions and restrictions as foreign associate individual members.

3. MEMBERSHIP INFORMATION—GENERAL

a. The term "members" except where specifically stated otherwise in the Constitution and in these By-laws shall mean full and life members only. Only these may vote or hold office.

b. The election to membership of all classes shall be by action of the Executive Committee, and the decision of that Committee as to eligibility shall be final.

c. Any person desiring to become a member shall make written application to the Executive Vice President. Said application shall be in such form and contain such data as may be prescribed by the Executive Vice President or the Membership Committee, in either case subject to the subsequent approval by the Executive Committee.

d. Any member may withdraw from the Association at any time by tendering his resignation in writing, but such resignation shall not become effective until said member shall have paid all obligations due the Association from him at the time of such resignation.

e. Any member may be dropped for cause by the vote of three members of the Executive Committee or, having been dropped, may be reinstated at the discretion of the Executive Committee.

f. All members are entitled to receive one copy each of the Association publications.

4. MEMBERSHIP DUES

a. The fee for *life membership* in the association shall be fifty dollars ($50.00).

For *full members*, five dollars ($5.00)

For *student members*, two dollars and fifty cents ($2.50).

For *foreign associate members*, five dollars ($5.00).

For *group members*, two hundred and fifty dollars ($250.00), except for small business firms (with 500 or fewer employees) for which the annual dues are one hundred and twenty five dollars ($125.00).

5. MEETINGS

a. The Executive Committee shall set dates and locations of conventions, conferences and meetings of the Association and shall provide for the management of same.

6. CORPORATE OBLIGATIONS

a. No obligation shall be incurred on behalf of the Association except by the Board of Directors acting through its Executive Committee and such person or persons as may be designated by the Executive Committee and then only to the extent of funds in the Treasury available to meet the obligation. All obligations incurred by the Corporation shall be solely corporate obligations and no personal liability whatsoever shall attach to, or be incurred by, any member, officer or director of the Corporation by reason of any such corporate obligation.

7. OFFICERS

a. The President shall have general supervision of the affairs of the Association and shall perform the duties usual to his office. He shall preside at the meetings of the Council, of the Board of Directors, and of the Executive Committee. He shall be *ex officio* a member of all committees and of all subcommittees thereof. In the absence of the President his duties shall devolve upon the Vice Presidents in order of seniority.

The First Vice President shall have general charge of memberships and the activities of local chapters.

The Second Vice President shall have general charge of the activities of the National Advisory Committees.

The Counsel shall be the legal advisor to the Executive Vice President, the National Officers, the Executive Committee, and the Board of Directors.

The Treasurer shall be the custodian of the funds of the Association under the direction of the Executive Committee. He shall render an annual report and such special reports as may be called for by the Executive Committee. The accounts of the Association shall be audited annually by independent auditors. However, in the discretion of the Executive Committee, a certified public accountant designated by it may conduct the annual audit, his report to be made to the Executive Committee.

f. The Executive Vice President, the Secretary and the Treasurer shall perform such duties and have such responsibilities and authority as may be prescribed from time to time by the Executive Committee.

g. The Executive Committee shall make appointments for unexpired terms to fill vacancies which occur in the offices of Executive Vice President, Secretary and Treasurer; in the event of incapacity, as determined by the Executive Committee, of the Executive Vice President, Secretary or Treasurer to effectively perform the duties of his office, the Executive Committee shall assign the duties, responsibilities and authority of such officer to a person or persons selected by it during the period of such incapacitation.

h. The Executive Committee shall be responsible to the Board of Directors for the management and operation of the National Headquarters executive offices of the Association, including the fixing of compensations of employees.

8. REGIONAL VICE PRESIDENTS

a. There shall be six Regional Vice Presidents, who shall be appointed by the President, subject to confirmation by either the Board of Directors or by the National Executive Committee.

b. Each Regional Vice President shall hold office from the time of his appointment and confirmation until the next annual meeting of the Association and thereafter until his successor has been appointed and confirmed. The Regional Vice Presidents shall assist the Executive Vice President and the First Vice President in matters pertaining to chapters and in such areas as shall be designated by the President.

9. FISCAL YEAR

a. The fiscal year shall close on March 31, 1951 and on March 31 of each year thereafter.

10. CHAPTERS

a. Upon petition stating that not less than fifteen (15) members of the Association in any locality desire to form a local chapter for the achievement of the purposes of the Association, the Executive Vice President of the Association shall immediately authorize a meeting, and assist in every way possible toward the organization of such chapter.

b. Upon the formation of a new chapter, the Association will issue a suitable charter, signed by the National President and the Executive Vice President of the Association.

c. Every member of the Association, unless he desires otherwise, will automatically become a member of the local chapter of the territory in which he resides, but no person shall be a member of a local chapter who is not a member of the Association.

The local chapter may collect annually all dues, both original and renewal, for all of its individual and group members. The sum of $5.00 for each full member may be sent to National Headquarters, $1.00 of which will later be returned to the chapter.

The annual group membership fee of $250.00 ($125.00 in case of small business), either original or renewal, shall be remitted to National Headquarters, and $50.00 ($10.00 in the case of small business) shall be distributed quarterly by National Headquarters to chapters, on a pro rata basis of paid membership at the end of the quarter previous to that in which the payment is made.

That proportion of the dues accruing to the National Association shall become the property of the Association. That proportion of dues remitted to the Chapter by the National Headquarters as above provided, shall become the separate property of the local Chapter.

d. Each local Chapter shall have power to select its own designation and draft its own Constitution and By-Laws provided that the same shall be in harmony with the Constitution and By-Laws of the Association and in furtherance of its objectives; provided further that the Chapter Constitution and By-Laws and all subsequent amendments thereto shall be submitted to the Executive Vice President of the Association for review, and approval by the Executive Committee before becoming effective.

e. Each local Chapter shall in the month of April each year file with the Executive Vice President, in the form prescribed, an annual report of its activities, finances, obligations, number of meetings held and other matters consistent with the objectives of the Association. Chapters may also be required to furnish intermediate reports as necessary for the conduct of the affairs of the Association.

f. The Charter of any local Chapter whose membership declines to less than ten members may upon thirty days' notice be withdrawn by the Executive Committee of the Association; however, the members thereof retain their membership in the Association.

The Charter of any local Chapter may be revoked by the Board of Directors for conduct inconsistent with the objectives or policies of the Association or prejudicial to the good order and repute of the Association.

g. It shall be the general purpose of the chapters of the Association to bring their individual and group members into a closer fellowship with each other and with the communication, electronic and photographic personnel of the Armed Services. This can be accomplished through the medium of chapter meetings, visits to military establishments, industrial plants and laboratories, and through seminars and discussions consistent with the national policies and objectives of the Association.

h. Sub-chapters or posts may be organized by chapters of the Association. Such sub-chapters or posts will be chartered by the parent chapter with an initial membership of at least five members of the Association in good standing. All applications and dues of such members will continue to be handled by the National Headquarters.

i. Student chapters may be organized at any college or university in the United States which carries electronics or communications courses in its curriculum.

A minimum of 10 student members may file petition for a student chapter. This charter will be issued by National Headquarters in accordance with Sec. b of this By-law.

11. RESTRICTIONS

a. No member of the military establishment of the Army, Navy, Air Force, or Coast Guard shall be employed by the Association in a paid capacity, except that articles written for publication may be paid for with the approval of the Executive Vice President.

12. NOMINATIONS AND ELECTIONS

a. On or before March 1st each year the President shall appoint a nominating committee, composed of not less than three nor more than five members of the Association. This committee shall draw up a slate of nominations for members of the Board of Directors and for officers of the Association and report to the fourth quarterly meeting of the Executive Committee thereon, to fill the vacancies which will occur in that year. Annually on or about March 1st the Executive Committee shall cause notice to be given to all Directors, and to Chapters for their Council representatives, that nominations for new Directors are in order and shall cause request to be made that the Council members submit to the chairman of the nominating committee such names as they desire to nominate for the Director vacancies to be filled. Similarly, notification shall be given to the Board of Directors of nominations of Officers of the Association.

Any group of twenty or more members in good standing of the Association may submit to the chairman of the nominating committee the name of a candidate or list of candidates, for membership on the Board of Directors. Such a petition shall be in the hands of the nominating committee at least four weeks before the annual meeting. If any person or persons so proposed is not included by the nominating committee in its list of nominations, then any member of that group proposing such person or persons may place his or their names in nomination before the Council at the same time as the names of those nominated by the nominating committee. No other person shall be voted upon or eligible for election as a Director. Those candidates receiving the highest number of votes shall be declared elected.

After the nominees are selected and after ascertaining if the proposed candidates will accept the posts indicated, the chairman of the nominating committee will submit the list of candidates for Directors and officers, at the annual meeting of the Council for appropriate action.

The officers of the Association will then be elected by the Board of Directors at their annual meeting. A majority of the Directors present shall be necessary for the election of any officer or member of the Executive Committee.

13. AMENDMENTS

a. The Board of Directors shall have the power to adopt and amend the By-laws by a majority vote of those present at any annual or special meeting of the Board at which a quorum is present.

14. INSIGNIA

a. The insignia or emblem of the Association shall consist of:

1. The central figure is an alert powerful American eagle with strong talons clutching lightning flashes—symbolic of a strong America insofar as national defense and especially modern communications are concerned—our basic reason for existence. The border consists of leaves of the olive branch of peace showing that the object of military preparedness in America is to assure a lasting peace. In the background are signal flags—the first means of signaling in the U. S. Signal Corps and a method still used for special purposes by the Navy. Just above the eagle and between his outstretched wings, is a heavy bomber in flight, symbolizing the complicated and essential communication in the Air Force, Marine and Naval aviation, both intra- and inter-aircraft, air-ground and on the ground. Above that is a radar antenna array and at the very top a radio relay antenna—for the latest major step in military communications. In the color version there are the traditional colors of the signal flags—dexter white flag with red center and sinister red flag with white center

(*Continued on page 97*)

NEW PRODUCTS from Industry

New Solvent for Electronic Parts

The electronics industry has a potential saving of millions of dollars in rejected parts and man-hours as the result of a recent resin solvent developed by the laboratories of Ram Chemicals, P. O. Box 192, Gardena, California.

Labeled De-Solv 292, the new liquid chemical compound disintegrates epoxy or polyester resins in which electronic components and systems have been embedded, simply by immersing the affected parts in the solution. Usuable parts may be salvaged.

Non-inflammable and having low toxicity, the new solvent proved suitable for use with parts based on nylon, formvar, and linen wrapped wire; all metallic components; ceramic capacitors and resistors, and miniature and sub-miniature electronic tubes. It will not harm phenolic base systems such as printed circuits.

New Charactron Tube at Stromberg-Carlson

A new model of the Charactron Shaped-Beam Tube which can reproduce 1,200,000 tiny letters and numbers per minute for recording photographically has gone into production at the San Diego plant of Stromberg-Carlson, a Division of General Dynamics Corp.

The new tube, designated the Type C7C11, has a seven-inch diameter. The small size of the characters enables the tube to reproduce nine times the information density (characters per square inch) possible with other models of the Charactron Shaped-Beam Tube, thus vastly reducing the number of pictures required to reproduce, in permanent form, the electronically produced characters.

Each character has been reduced to a height of .035 inches. Ten thousand can be reproduced for photographing in one frame, arranged in the form of 100 lines of 100 characters each. The tube can display characters at a rate of 20,000 per second.

The Charactron Shaped-Beam Tube has been called an "electronic typewriter" because it utilizes a stream of electrons to create numbers and letters at split-second speeds on a phosphor-coated screen, similar to the screen of a television set.

Wamoscope for TV and Radar

Just produced by Sylvania Electric Products, Inc., under contract to the Office of Naval Research, is a radically new type of cathode-ray tube for radar, TV, and other electronic display applications.

Named the "Wamoscope," it combines most of the essential functions of a microwave receiving set in a single tube envelope. Its name is derived from the technical term, wave-modulated oscilloscope. Official designation for the tube, now being used in high-priority research and development projects in all three Armed Services, is Tube 6762.

Just under two feet in length, with a present screen diameter of 5 inches, the "Wamoscope" presents a wide selection of channels for any receiver utilizing it.

Rain Repellent for Windshields

Foster D. Snell, Inc., has developed a rain repellent for use on glass or plastic windshields of airplanes.

The repellent, made up especially of silicones and a combination of natural and synthetic waxes, will last for several days of heavy rain. The windshield can then be cleaned and recoated.

The repellent resists rain by setting up a hard coating on the glass which makes water behave more like heavy beads of mercury. As the rain hits the specially treated glass, it is swept off in beady, droplet form with the help of the wind and speed of the plane.

This new treatment is available in kit form, each kit containing three items, one of which is a solvent for the removal of dirt and grease from the windshield. This solvent does not affect glass or acrylic windshields. The second component is a paste whose function is to effect adhesion of the rain-repellent film to the windshield; the third is a combination of natural and synthetic waxes in stick form.

One complete application takes 10 to 20 minutes, depending on the size of the windshield, and each kit contains about 40 applications.

Printed Circuit Connector

The DeJur-Amsco Corp. has introduced a new, special-design, printed circuit connector developed for guided missile, pressurized printed

Below: An electronics worker uses a torch to seal an electron gun into a glass envelope in the manufacture of a Type C7C11 Charactron Shaped-Beam Tube, designed and produced by Stromberg-Carlson, a Division of General Dynamics Corp.

circuit applications.

There are 15 coded contacts mounted in an Orlon-filled, Diallyl Phthalate molding compound. Design permits either horizontal or vertical mounting. A potting shell is supplied with the connector. Wiring feeds through holes in the potting shell, which line up with right angle solder lugs.

In the assembly of the printed circuit, a rubber boot fits over the printed circuit board to form and integrated, moisture-proof assembly.

Home Interadiocom

The Stratford Corporation has introduced a new intercommunications system for home use.

Interadiocom, the new home intercom and radio, is a sensitive system which can service 5 relay stations within the home, permitting simultaneous radio and inter-room communication reception at each or any of the outlets.

The new intercom allows complete communication between various parts of the house, attention to baby's breathing or playing sounds, protection from intruders at the door, and music in all rooms in the house. The master set can be additionally used as an electric or alarm clock, a radio alarm, and will simultaneously brew the morning cup of coffee and toast the bread.

The interadiocom unit allows the usage of radio and interphone at the same time. An exclusive electronic engineering feature automatically causes the sound of the voice to tone down the radio, thus facilitating conversation.

Oscillator Wand

Stancil-Hoffman Corp. has introduced an Oscillator Wand, Model AO11, designed as a maintenance tool for fixed and portable magnetic recording equipment.

Occasionally, field equipment is dropped or mishandled, and checks must be made immediately before risking a production recording. The company reports that the oscillator wand will thoroughly check a channel in a matter of seconds.

Ultrasonic Fog Dissipator

A new, ultrasonic device which promises to solve the problem of fog dissipation of airports and highways, and greatly improve industrial processes, such as radio active waste disposal, concentration of fissionable ores, precipitation of aerosols

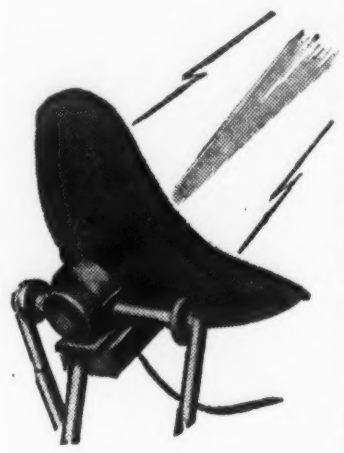
(*Continued on page* 94)

ENGINEERS: *Electronic & Mechanical*

Physicists:

Work where PERFORMANCE pays off

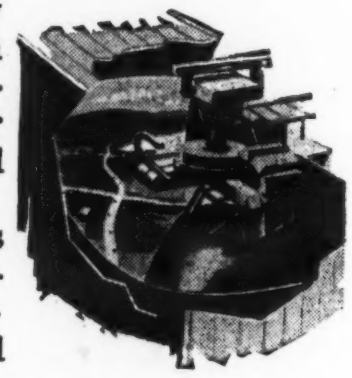
Men of talent and drive can move ahead without delay or red tape at Melpar because skill, ability and performance are the *primary* factors governing advancement. Due to the fact that we've doubled in size every 18 months since our beginnings in 1945, middle and top level positions open up constantly.



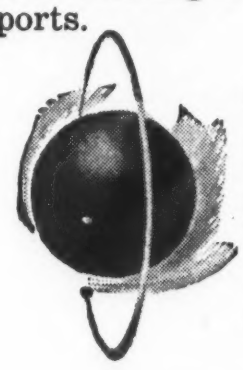
Melpar believes that the engineer deserves an organization and facilities that can enhance his creative abilities. For this reason our laboratories were designed and built to specifications prepared by Melpar engineers. A wealth of equipment is available. Our project group system enables the engineer to participate in all phases of development problems and thus quickly acquire greater technical and administrative know-how, essential to eventual managerial responsibility. The system also enables us to more accurately evaluate the individual's contribution and more rapidly justify promotions.

Live Where You LIKE It

Living—for the whole family—is immensely rich in the two locales where Melpar's R & D activities are centered. Our 265,000 sq. ft. main laboratory near Washington, D. C., enables you to live in an area enjoying incomparable cultural and recreational advantages. The climate allows outdoor recreation 215 days of the year. Fine homes and apartments are available in all price ranges.



Our Watertown and Boston, Mass. laboratories offer the unique advantages of cosmopolitan Boston with its theatres, concerts, art galleries, museums, universities and schools which are second to none. Nearby are seaside and mountain resorts offering a variety of winter and summer sports.



Openings Exist in These Fields:

Flight Simulators • Radar and Countermeasures • Network Theory • Systems Evaluation • Microwave Techniques • Analog & Digital Computers • Magnetic Tape Handling • UHF, VHF, or SHF Receivers • Packaging Electronic Equipment • Pulse Circuitry • Microwave Filters • Servomechanisms • Subminiaturization • Electro-Mechanical Design • Small Mechanisms • Quality Control & Test Engineering

Write for complete information. Qualified candidates will be invited to visit Melpar at Company expense.

Write: Technical Personnel Representative

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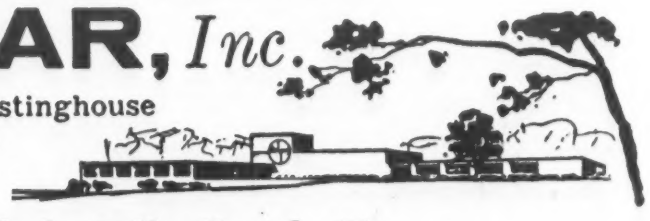

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Openings also available at our laboratories in Watertown and Boston, Mass.

and dust particles, cleaning, sterilization, and mixing of paints, has recently been developed. The instrument, a Multiwhistle RD Air-Jet Ultrasonic Generator, will be manufactured and marketed in the United States by Gulton Industries, Inc.

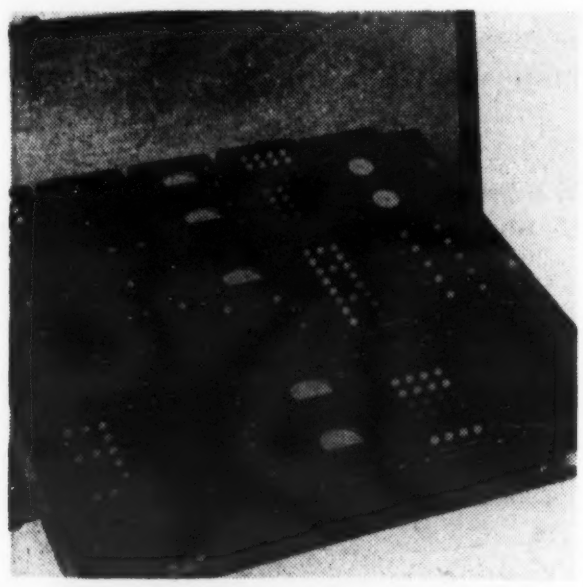
The Multiwhistle RD is being used extensively in Europe as a very high-intensity source of sonic energy ranging from 4 to 40 kilocycles, and its application for fog dissipation is currently being investigated under sponsorship of the French Air Force.

The device can be operated in either gas or liquids and may be used in corrosive atmopshere or in temperatures as high as 700° C. There are no moving parts or electronic components. An air compressor or steam generator furnish the driving power which is converted to ultrasonic energy with an efficiency greater than 20%.

Instant Circuit System

Instant Circuits, a division of Alfred W. Barber Laboratories, has developed a system for transistor circuit design, consisting of a number of individual units, each of which comprises a basic circuit element, signal source, or test instrument.

The basic kit of fifteen individual units permits general circuit synthesis and testing in the audio range. High-frequency units may be added to extend the range.



Pictured above is a transistor circuit design system, a product of Instant Circuits a Division of Alfred W. Barber Laboratories.

"Bread-boarding" of a circuit is eliminated, since the Instant Circuit system permits circuits to be set up in 3-to-5 minutes by means of color-coded pin-tip leads and pin jacks connected to all circuit elements. Circuit design testing, experimenting, teaching, and learning the "feel" of circuits are all carried out with a great saving of time.

A wide range of circuit component values is included, embracing potentiometers, fixed resistors, fixed capacitors, inductors, transformers, speakers, transistor and tube sockets, batteries, meters, junction tie point, and various signal sources and test instruments.

Conference Recorder

Thomas A. Edison, Inc., has put on the market a continuous recorder which permits the recording of long conversations and executive meetings without interruption.

Called VPD-3, the dictating equipment uses two machines that automatically switch from one to another as discs become full. A completed disc is ready for transcribing every 15 minutes. An overrun is made as the change from one machine to another is completed, so that recording of all material is assured.

The machine can also be used for normal dictation.

Microfilm Reader

A microfilm reader which has scanning speeds of one foot per minute to a rewinding speed of 600 feet per minute has been produced by Recordak Corp. Called the model PM-1 reader, the unit utilizes a thyratron tube motor power control.

A built-in feature allows for reproduction of original records in paper form from microfilm on specially sensitized paper within a few minutes.

Magnifications of 23, 30, and 40 diameters are available by interchangeable lenses in this model.

G-Line Assembly

G-Line is the trade name for Prodelin Inc.'s single-wire transmission line assembly used to guide radio frequencies in a transverse-magnetic, radially symmetric, non-radiating mode.

G-Line consists of a single, modified surface wire coupled at each end with identical field transformers (launcher and collector). Each transformer is a conical-shaped unit that couples the transmission line ends to the coaxial feed line and provides an efficient transition between the transverse magnetic field on the line and the transverse electric field in the coaxial feed line.

The housing contains mechanical mounting and electrical connecting devices for the transmission line, coaxial feed line, de-icing power cable and guy assembly. The cone is weather-proofed by means of a conical fibreglass shield.

Fast Data Recorder

Development of a device which can record data from modern electronic computers many times faster than any previously used method has been announced today by Stromberg-Carlson, a Division of General Dynamics Corporation.

The new device is capable of recording data equal in amount to that in a 300-page book in just 30 seconds.

Designated Model 100, it can record in permanent form the output from an electronic computer at speeds more than 10 times those attained by any computer readout system previously used.

Mini-Test

Mini-Test, the pocket-size voltage tester, will check unknown voltages from 65 volts to 800 volts, A.C. and D.C. currents.

Manufactured by Omega Products, the Mini-Test has many applications: to check whether voltage is A.C. or D.C.; to trace open lines, blown fuses, etc.; to check continuity in high or low ohmage; to check voltage drop on lines when several appliances are connected at the same time; to determine whether voltage is adequate to carry air conditioners or other heavy appliances; to "trouble shoot" all electrical appliances, such as radios, television, irons, toasters, washers, dryers, and motors.

Voltages are read directly from the Mini-Test dial, and exclusive clip-on leads allow hands to be free to work while the Mini-Test is being used.

"Hamscope"

The "Hamscope" is a simplified cathode-ray oscilloscope, designed specifiically for checking the operation of amplitude-modulated and single-sideband transmitters operating in the 1,8 - 30-megacycle frequency range. The "Hamscope" is produced by the General Electric Company, Tube Department.

The screen patterns will tell a more complete story about linearity, distortion, percentage of modulation, than meters or similar indicators.

Since a linear sweep, vertical and horizontal deflection amplifiers and other complications are not needed for examining transmitter output, this 'scope is reduced to essentials — the

cathode-ray tube; a tuned circuit for applying RF voltage to the vertical deflection plates; a 60-cycle or audio frequency sweep on the horizontal plates; and a high-voltage power supply.

For the Photographer

New High-Speed Camera

Electronic Tube Corp. has introduced a new recording camera with film speed range from ½" to 12,000" per minute in three overlapping continuous ranges.

Designated Model SM-100, this camera has been designed primarily for use with 5-inch oscilloscopes. It is capable of making either single-frame or moving-film recordings.

The unit consists of a 17" x 24" x 13" camera with supply and take-up magazines, a universal-type mounting tripod, and a continuously variable motor speed control.

Kodak Data Book Revised

Data sheets on the high-speed, high-definition Kodak Ektacolor, Type S, and the Kodacolor Film are included in a new edition of "Kodak Color Films," now available from the Eastman Kodak Co.

The publication provides complete, practical information on the Kodak materials designed for still color photography to help the photographer realize the full potentialities of these color films. Important aspects of handling these materials are discussed in the text, while exposure and filter recommendations for individual films are given in Data Sheets.

Material on color balance and speed has been expanded to form a new section on a critical use of color film, illustrated in color. Data Sheets are also included for Ektacolor Type B (Process E-1); Kodachrome. Daylight and Type F; and Kodachrome Professional Type A.

Subjects discussed in detail are: types of films, filter data, storage before and after processing, processing, viewing transparencies, critical use. and prints and duplicates.

This new edition represents the first complete revision of the Data Book since its introduction. Altogether, there are 72 pages, 12 more than in the first edition, and almost all the illustrations are new.

Copies of "Kodak Color Films" may be obtained from Kodak dealers.

(Continued on page 97)

For more than 40 years North has pioneered in engineering and manufacturing "brains" for switching, supervising and recording, in communications and in systems or components for:

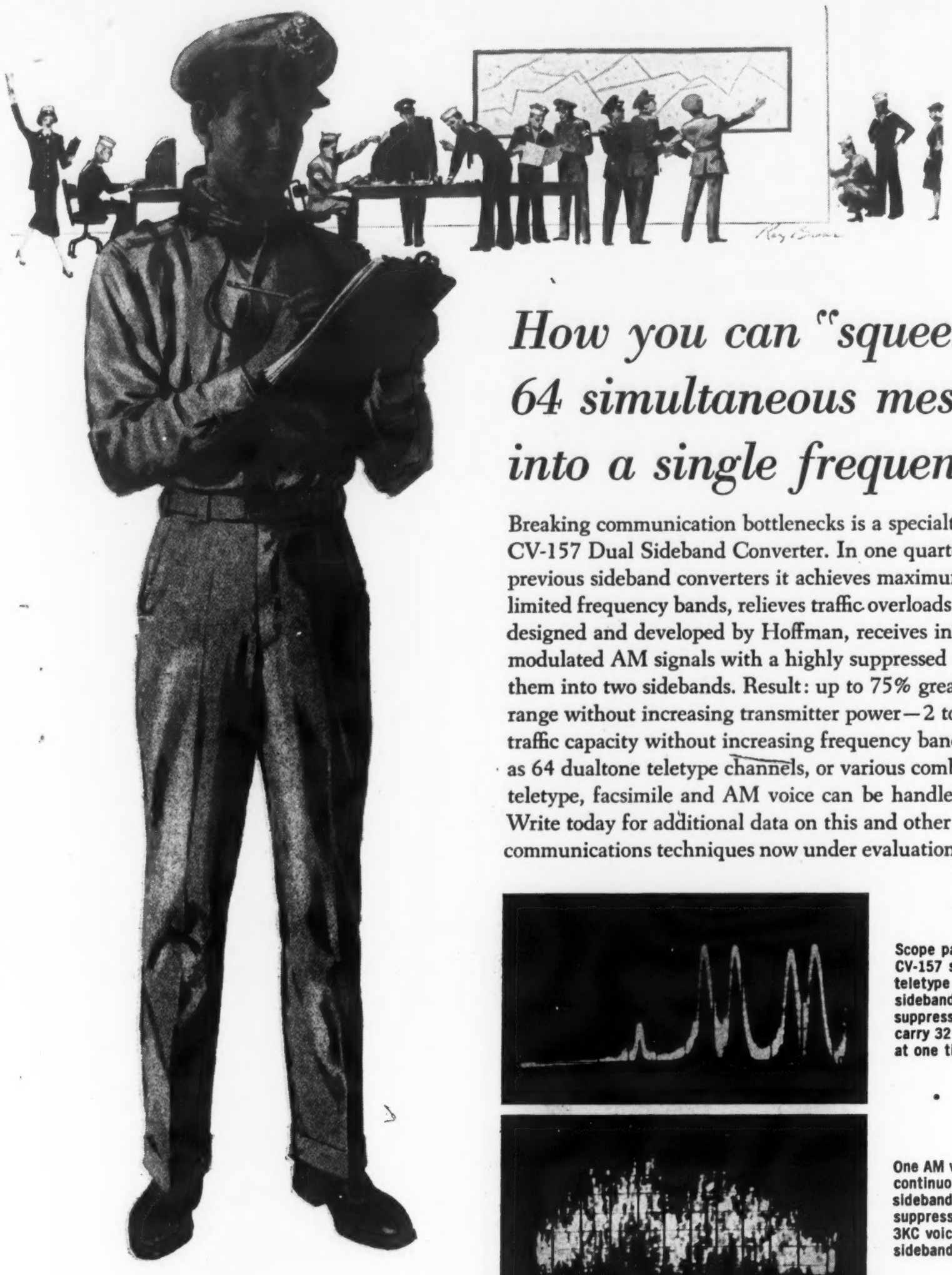
- Computation
- Remote supervision and control of unmanned equipment.
- Data input and output sequencing.
- Memory and reporting functions.
- Missile guidance.
- Other airborne automatic controls.
- Many other "automations."

When you must meet critical industrial or military specs which go beyond the usual meaning of "dependability" call on North to collaborate in or take over your problems.

Our field engineers are strategically located in the important industrial areas.

NORTH ELECTRIC COMPANY

INDUSTRIAL DIVISION 458 S. Market St., Galion, Ohio

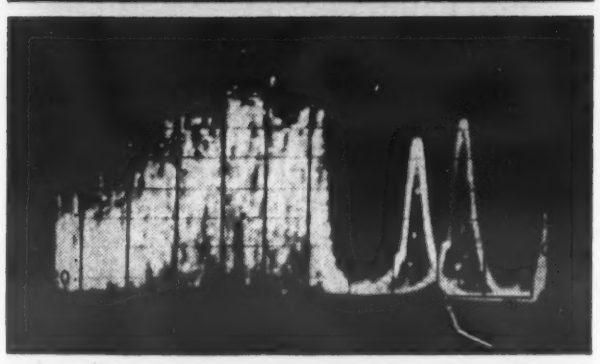


How you can "squeeze" 64 simultaneous messages into a single frequency

Breaking communication bottlenecks is a specialty of the Hoffman CV-157 Dual Sideband Converter. In one quarter the space of previous sideband converters it achieves maximum use of today's limited frequency bands, relieves traffic overloads. The CV-157, designed and developed by Hoffman, receives independently modulated AM signals with a highly suppressed carrier and splits them into two sidebands. Result: up to 75% greater effective range without increasing transmitter power—2 to 32 times more traffic capacity without increasing frequency bandwidths. As many as 64 dualtone teletype channels, or various combinations of teletype, facsimile and AM voice can be handled by the CV-157. Write today for additional data on this and other advanced communications techniques now under evaluation at Hoffman.

Scope pattern taken from Hoffman CV-157 showing two dualtone teletype channels on upper sideband, carrier partially suppressed. Each sideband can carry 32 teletype channels at one time.

One AM voice channel (made by continuous vowel sound) on each sideband, carrier completely suppressed. CV-157 carries two 3KC voice channels on each sideband.



AM voice on lower sideband, dualtone teletype channel on upper. With suitable multiplexing equipment, the CV-157 handles 64 simultaneous dualtone teletype channels.

ALL PHOTOS UNRETOUCHED FROM PANALYZOR MODEL SB-8

Electronics and Mechanical Engineers
Significant developments at Hoffman in the fields of VLF, HF, VHF, UHF, forward scatter and tropospheric communications, single sideband and advanced ECM techniques have created important positions for engineers of high calibre. Please address inquiries to Vice-President of Engineering.

Hoffman LABORATORIES, INC.
A SUBSIDIARY OF HOFFMAN ELECTRONICS CORPORATION
3761 South Hill Street • Los Angeles 7, California

(*Continued from page* 91)

—with a gold border to the whole.

2. Insignia in this form with ribbon and modifications of it in the form of pins, badges, buttons and rings, shall be authorized by the Board of Directors for use of members. The ribbon shall be of three stripes of equal width, of dark blue, orange, and light blue—total width to be 1⅜ inches.

b. The flag of the Association shall be the above insignia superimposed upon a field of sky blue cloth —representing the medium through which modern signals are transmitted. Under the insignia shall be a scroll on which shall be inscribed "National Security through Military Preparedness."

15. NATIONAL ADVISORY COMMITTEES

a. Members of the Association shall be eligible for membership on National Advisory Committees devoted primarily to the problems of the Armed Services and to the advancement of knowledge, engineering practices and production and design techniques relating to the special fields of communications, electronics or photography and to activities of the Association.

b. These committees shall be organized in conformity with conditions in each particular field rather than according to any standard pattern.

c. Each committee shall have a chairman selected by the President of the Association and approved by the Executive Committee. The other members shall be designated by the chairman. Through meetings, conferences and discussions and in cooperation with local chapters, they shall keep the membership in close contact with progress and developments in their specific fields. They shall meet as committees from time to time to initiate recommendations or reports and shall be available in an advisory capacity on such matters as may be presented for their study and report by the Armed Forces or the Association.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, etc., required by the act of Congress of August 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946, of SIGNAL Magazine, published bi-monthly at Washington, D. C., (additional entry, Baltimore) for October 1956.

District of Columbia }
City of Washington } ss.

Before me, a notary public, in and for the State and County aforesaid, personally appeared W. J. Baird, who, having been duly sworn according to law, deposes and says that he is the Editor of the SIGNAL Magazine and that the following is, to the best of his knowledge and belief, a true statement of the ownership and management of the aforesaid publication for the date shown in the above caption, required by the act of August 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:

Publisher: Armed Forces Communications and Electronics Association, 1624 Eye St., N. W., Washington 6, D. C.

Editor: W. J. Baird, same address.

Managing Editor: Judith H. Shreve, same address.

Business Manager: Burnett R. Olmsted, same address.

2. That the owner is: (if owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual member, must be given.

Armed Forces Communications and Electronics Association, 1624 Eye Street, N. W., Washington 6, D. C.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are:

None.

4. That paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also that the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

W. J. BAIRD,
Editor.

Sworn to and subscribed before me this 21st day of September, 1956.

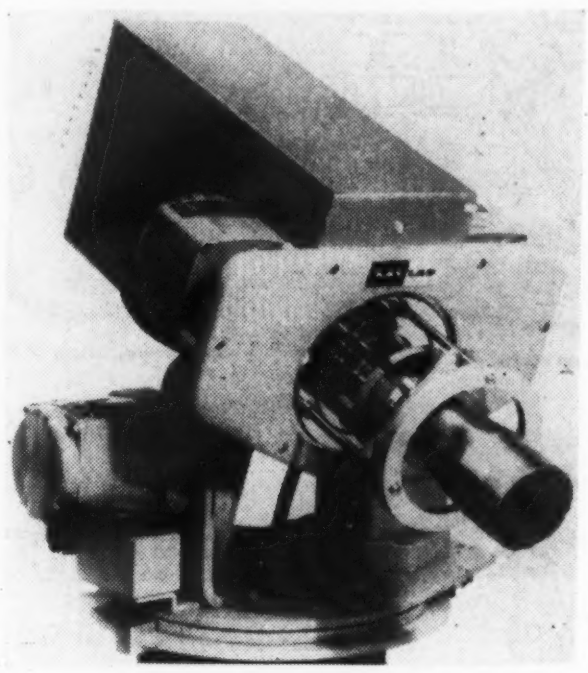
(Seal) MARIANNA D. WAGGAMAN,
Notary Public.

(My commission expires April 14, 1957)

Camera With Acoustical Housing

Kay Lab has announced the completion of a new ruggedized camera with acoustical housing. Before these instruments were designed, industrial television cameras could not operate properly under high ambient noise conditions. These units are ideally suited for rocket and jet engine test facilities, rocket launching sites, and similar applications where noise conditions prohibit the use of ordinary equipment.

The ruggedized equipment has been used to observe rocket engine



Pictured above is Kay Lab's ruggedized camera with acoustical housing.

tests. Previously measured sound levels at the test site were well over 150 db. These are extremely high levels, since the threshold of pain for humans is approximately 100 db, and sound levels over 140 db can cause actual injury to the human body.

During all of the tests, the Kay Lab system performed perfectly. There were no noise bars on the monitor, and the cone of fire shooting from the engine being tested could be seen clearly.

New Electronic Light Sources

The search for newer, better, and brighter light sources is never ending, and this is particularly true in the case of light sources used in photography. Two new items which have recently appeared in this field include an RF (radio frequency) operated incadescent lamp by the Sylvania Co., and a sapphire lamp by the Bell Telephone Laboratories, Inc.

The Sylvania RF lamp uses a 3.5 megacycle output from a 1.5 kw oscillator as a power source, and transforms this radio frequency energy into light energy so brilliant that it is claimed to be brighter than any incandescent lamp now existing.

Some applications suitable for the lamp include TV tube manufacture, medical research, radar and air traffic control, computers, projectors, and motion picture film printing.

In a somewhat different category is the new sapphire lamp recently developed by the Bell Telephone Laboratories, Inc. The sapphire lamp, which is believed to give off more ultraviolet light than any other known source, is machined from a rod of pure synthetic sapphire. The circuit consists of a 108-microfarad capacitor and a 4-kilovolt power supply in parallel applied across the electrode of the lamp.

In addition to its use as a highly ultraviolet source, the lamp should find application in motion picture projectors, research in photo chemistry, and upper atmosphere studies.

New, Triple-Purpose Projector

A new-type, triple-purpose, still projector, designated the "Transpaque," has been developed by Projection Optics Co., Inc.

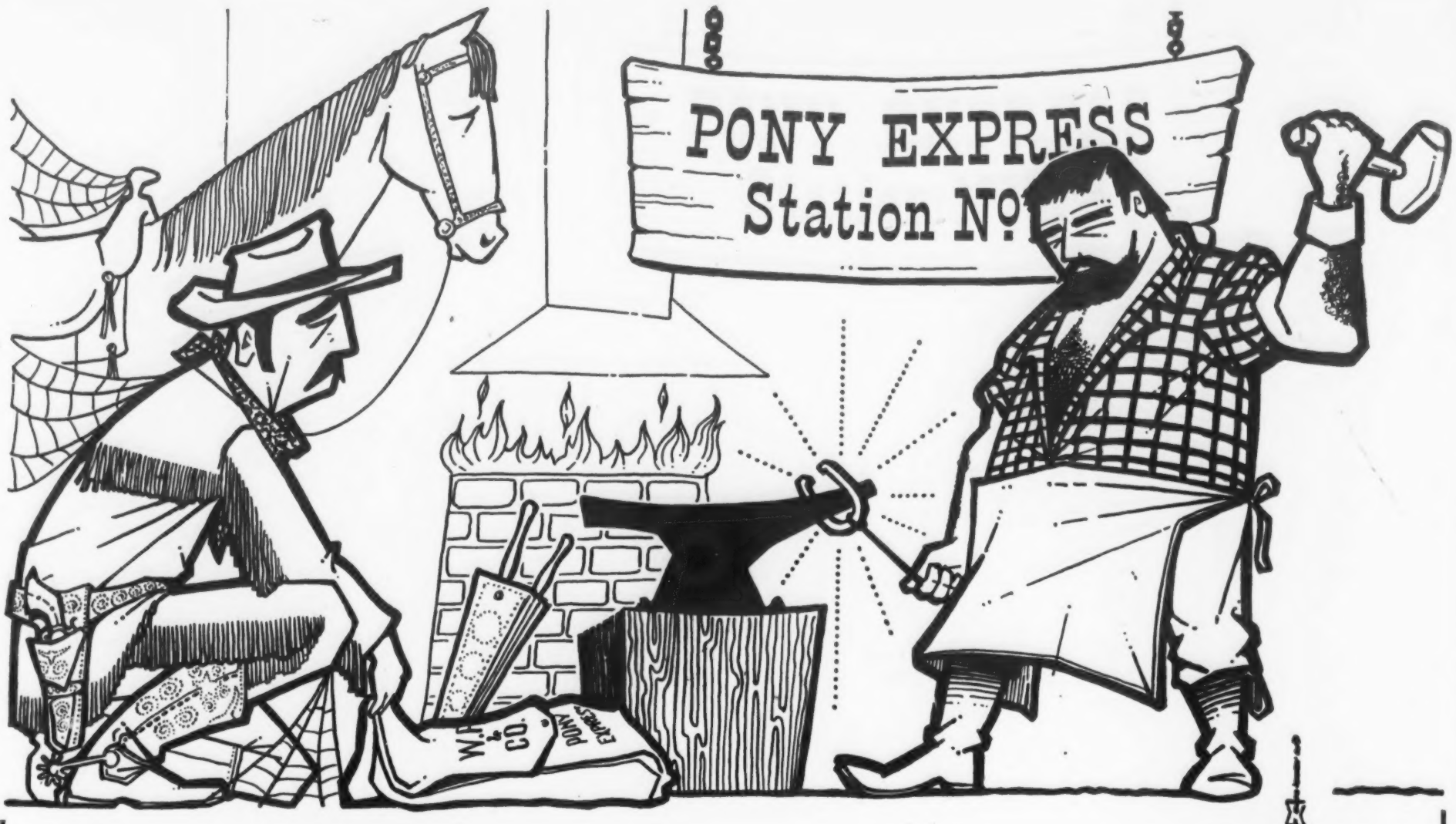
The projector is designed for use in projecting 11-inch square opaque or transparent materials and segments of maps, blueprints, drawings, and similar materials of the same size. If desired by the user, the "Transpaque" may be purchased for opaque, for transparency, or for table projection only, and other components may be added later as required. Change from one form of projection to another can be made quickly and easily.

The projector uses a 100-watt lamp, and is equipped with an illuminated optical pointer. A double blower provides for quiet, cool operation. Lenses available include a variety of focal lengths. A full line of accessories is also available.

Electric Changer for Slide Projectors

A completely new TDC Electric Changer for automatic slide projection has been announced by the Bell & Howell Co. Attached to manual TDC projectors now in the field, the new changer converts them to automatic models, so that the operator, seated away from the unit, may change slides by merely pressing a button.

The TDC Electric Changer is the first completely integrated unit. Constructed of lightweight die-cast aluminum, it is complete with a compact

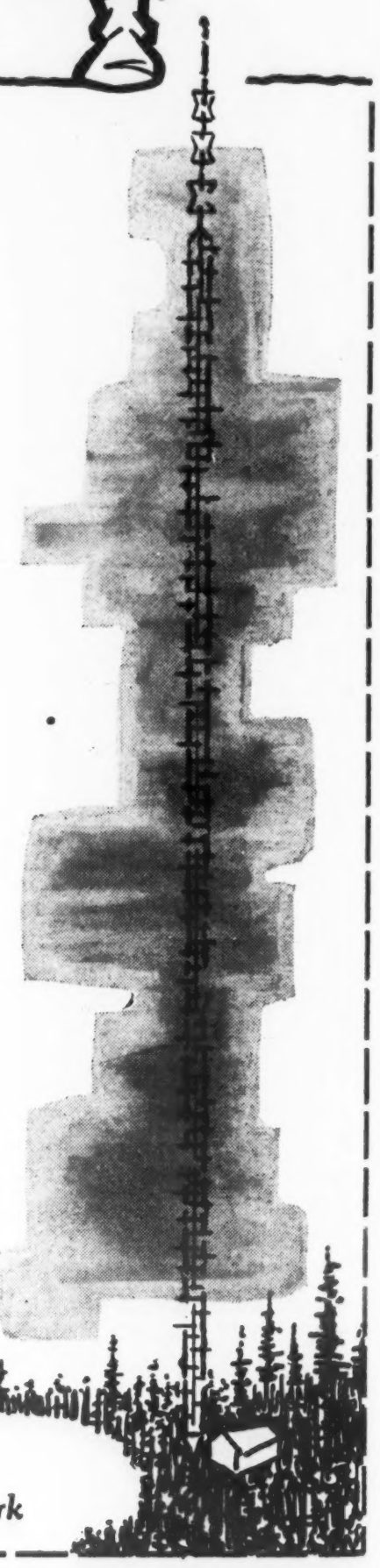


PONIES or TOWERS...

THEY BOTH NEED MAINTENANCE

Even the sturdy steeds of the Pony Express required occasional stops at the local smithy for "preventative maintenance." A cast shoe was a major catastrophe when communications and a rider's scalp depended upon a swift pony. But, the Pony Express passed into history quickly. as the telegraph spun its copper web across the nation. Maintenance problems became increasingly complex. Communication systems demanded more than a blacksmith. Today, they require electronic specialists like those at TOWER. Experienced crews are at your call for complete service inspections of your entire system, as well as for specific trouble calls anywhere along the line. Investigate TOWER'S contract maintenance service. There's a plan to serve your needs.

Write for free illustrated booklet



TOWER

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electric control box, an attached slide changer with folding guide arms, a slide tray which accommodates up to 30 slides, and a remote control switch with push-button operation and 10-foot cord.

The operator governs the showing time of each slide by pressing the remote control switch. Slides may be changed in 1½ seconds. During changing, a light shutter interrupts the light beam so that the screen is dark between slides. The changer accommodates any 2 x 2-inch slide in glass, metal, or cardboard mounts.

The Bell & Howell TDC Electric Changer is available from photographic dealers.

Polaroid Filter Rotoscreen

An important attachment that should be of interest to all photographers—amateur as well as professional—is the new Polaroid Rotoscreen, developed by the Tiffen Marketing Company.

The Rotoscreen attachment has a Polaroid Filter mounted in a rotating assembly and an accessory viewfinder through which the photographer can see the image exactly as it will appear.

The filter eliminates unwanted glare and washed-out color, darkens blue skies for color film without affecting surrounding colors, shoots clearly through glass and water, and brings out undiscovered details and textures, often invisible to the human eye.

The Rotoscreen controls the degree of polarization desired and fits on any filter adapter ring. The filter factor is 2.5 with all films. Price of Series 6, complete unit with viewing screen, is $18.95.

New Literature

How To Become A Radio Amateur

The American Radio Relay League, Inc., has recently published the 1956 Edition of *How To Become Amateur*, standard guide for the beginner in amateur radio.

This completely rewritten and revised text opens with a chapter describing the lure of amateur radio, pointing out its many facets and interests. Following this introduction, there is an extensive section on the fundamentals of radio, and the beginner is led step-by-step through more advanced radio practices.

The manual is 148 pages long, and it includes more than 100 photographs and illustrations. Its price is 50¢.

Murder In The Model Shop

Murder in the Model Shop, an amusing, 48-page detective story that recounts the solution of servo system and instrument design problems via Servoboard electro-mechanical assembly kits, is available from the Servo Corporation of America.

This detective "thriller," based on actual design engineering problems, is followed by a section that details the applications, advantages, and precision components of the Servoboard kits.

The little novel of suspense adds a new dimension to modern fiction by its penetration into the hopes and on-the-job lives of the working engineer.

Allied Radio Releases 1957 Catalog

Allied Radio Corp., distributor of electronic parts and equipment, announces the release of the 1957 general catalog. This new, 365-page manual lists over 27,000 items, and is the biggest catalog published by any electronics distributor.

The new handbook (No. 160) features the latest high-fidelity components, including 34 complete hi-fi systems. There is a wide selection of supplies, books, manuals, diagrams, tools and hardware, plus thousands of other radio, television and industrial electronics items.

This new 1957 electronics catalog is available free on request. Write to Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill.

AMF Offers Free Electronics Handbook

A handy 20-page booklet entitled *Electronic Facts Handbook* has just been published by the Electronics Engineering Section of American Machine & Foundry Company's General Engineering Laboratories.

The pocket-size handbook is a collection of carefully selected reference data useful to people concerned with Government and industrial Research and Development activities.

A complimentary copy of the booklet will be sent to those writing on company letterhead to: Public Relations Department, American Machine & Foundry Company, 261 Madison Avenue, New York 16, New York.

The 107-A Test Set and Field Intensity Meter combines in one portable unit a radio receiver of laboratory quality with metered output and an accurately calibrated signal generator. These instruments, which can be used separately for a variety of test purposes, cover a frequency range of 54 to 240 megacycles without band changing.

SPECIFICATIONS

RECEIVER
- Input Impedance ..... 51 ohms
- I.F. Frequency ..... 21.4 MC
- I.F. Bandwidth ..... 300 KC
- Sensitivity at input term. as a voltmeter.. 1.0 uv
  Field Strength at 54 MC..... 1.6 uv/m
  Field Strength at 240 MC..... 6.5 uv/m
- Max. input using external pad supplied.. 10.0 V
  Field Strength at 54 MC..... 16.0 V/M
  Field Strength at 240 MC..... 65.0 V/M
- Output Indicator ..... Panel meter (approx. Logarithmic scale)
- Output: 1. To operate at 1.0 milliampere recorder. 2. Audio for headphones.

SIGNAL GENERATOR
- Output ..... 1.0 uv to 0.1 V
- Output Impedance ..... 51 ohms

POWER REQUIREMENTS
- 117 volt a-c, 50-400 cycle..... 60 watts—or
- 6 volt, d-c ..... 8 amperes

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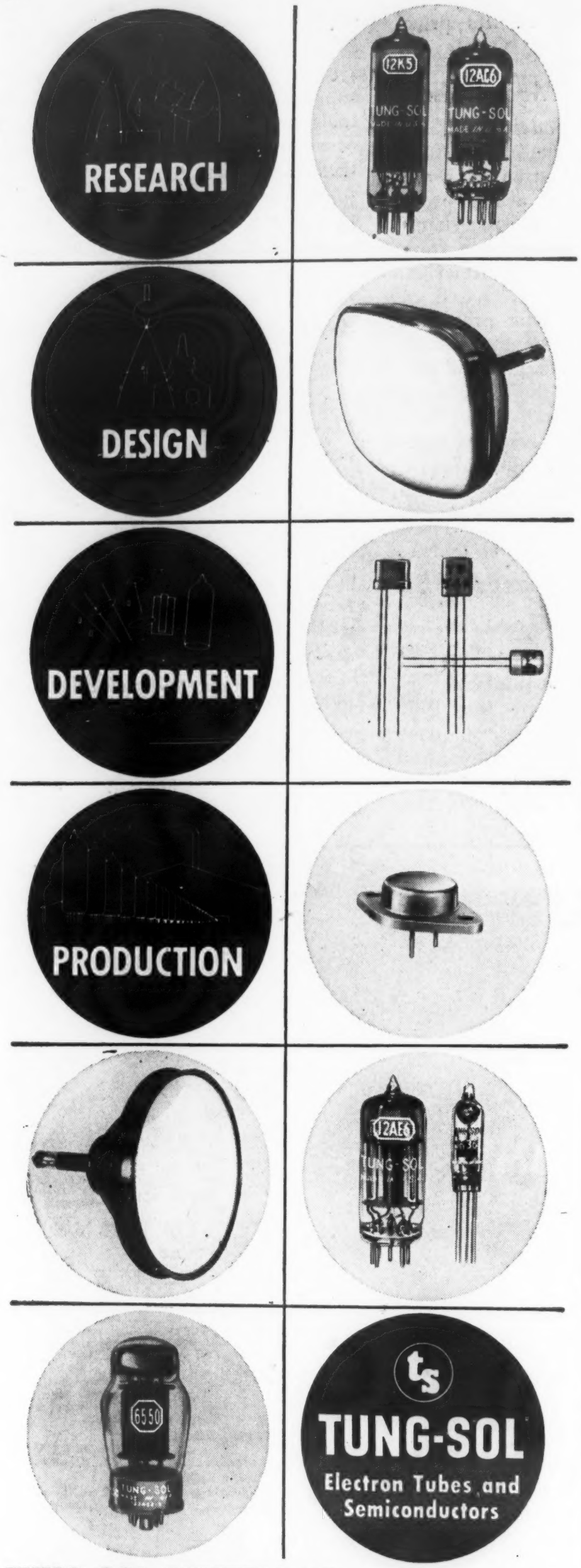

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AFCEA Members Available to Industry

The pages of SIGNAL are open to active AFCEA members who are seeking positions in the communications, electronics and photographic industries. Any member is entitled to space free of charge in this column for three issues of the magazine. Please limit your notice to five lines. In replying, employers are asked to address: Box ——, SIGNAL, 1624 Eye Street, N. W., Washington 6, D. C. Letters will be forwarded to the AFCEA member.

DISTRICT SALES MANAGER OR FIELD REPRESENTATIVE for electronics or associated firm. Excellent contacts with industry and Government agencies in 11 Western states. Fully cognizant of Western industrial expansion. Familiar with all Western Government projects and R&D operations. Capable of setting up Western office, advertising program, marketing, distribution program. Box 120.

SALES ENGINEER: ADVERTISING—SALES PROMOTION MANAGER. Recent sales experience plus 10 years' experience in advertising and sales promotion of electronic products. Radio amateur for over 20 years. Age 37. Engineering education of 3 years and B.S. in Marketing degree. Prefer West or East coasts. Box 121.

COMMUNICATIONS SPECIALIST—COMMUNICATIONS SYSTEM MANAGER with leased long-line interphone experience plus 10 years military and civilian air traffic control. Broad background in electronics, air operations, and flight movement. AB and LLB degrees. Will consider any location. Box 122.

Government and Military Positions Available

Government and military agencies are invited to use this column to announce available positions which may be of interest to the readers of SIGNAL. Notices will be published three times if not cancelled before. Applicants apply as indicated in individual notices.

ORDNANCE ENGINEER ($7,000/year). Assistant Inspector of Naval Material, Germantown, Pa., has opening in development and production of ordnance equipment. Requirements: Bachelor's degree in engineering (or four years' equivalent experience) and 2½ years' engineering experience, one in ordnance engineering. Master's degree can be substituted for one year's experience; Doctor's degree in ordnance engineering can be substituted for all experience. For further information, write: Supervising Inspector of Naval Material, 17 Brief Ave., Upper Darby, Penna.

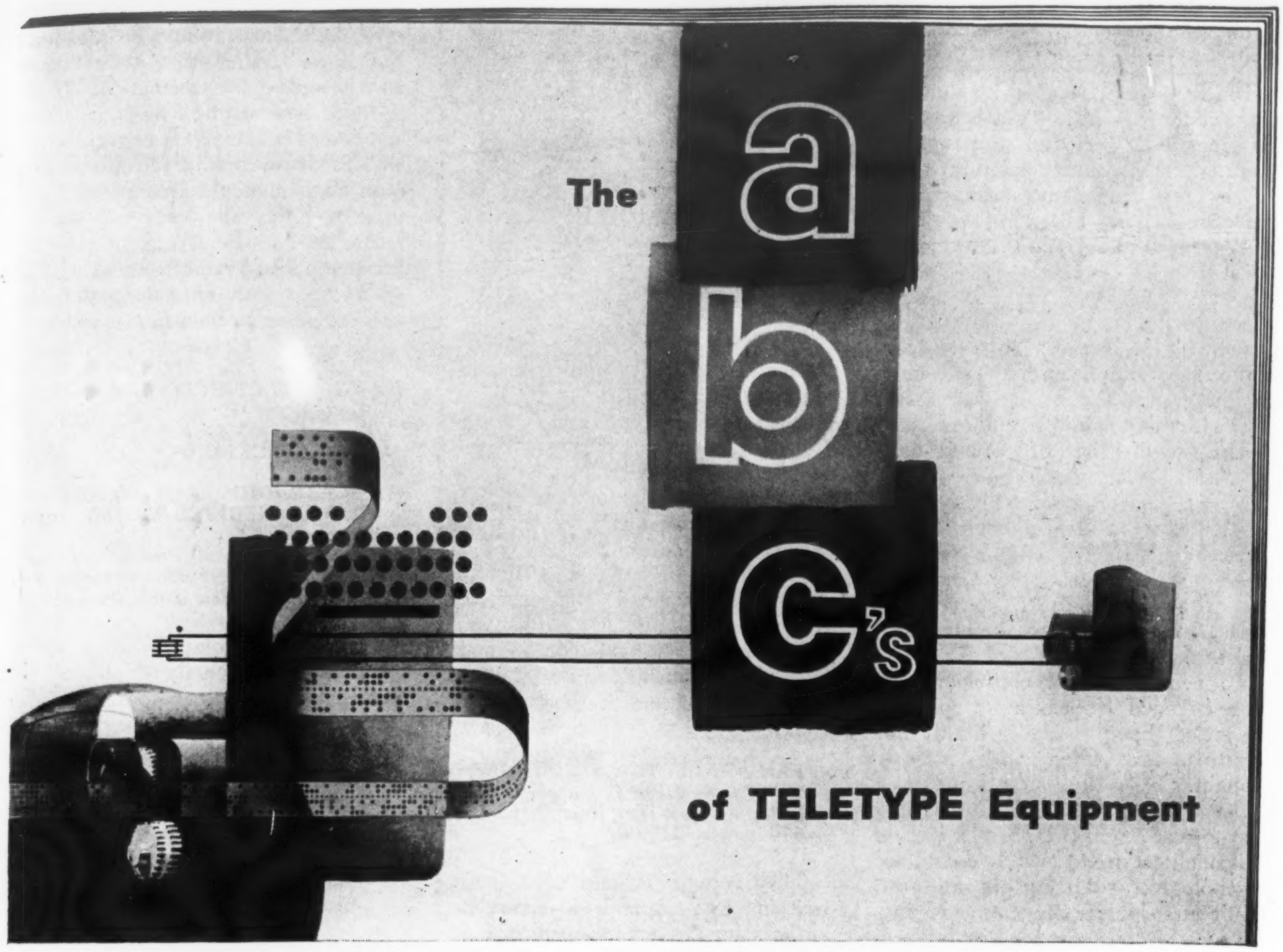
ELECTRONIC ENGINEERS, ELECTRONIC SCIENTISTS, MECHANICAL ENGINEERS, starting salaries $5,335-$6,390. ENGINEERING DRAFTSMEN, $3,415-$4,080. Vacancies now exist at the U. S. Navy Electronics Laboratory, a major West Coast scientific organization engaged in research and development of electronic equipment and systems. For further information address: U. S. Navy Electronics Laboratory, Civilian Personnel Division, San Diego 52, California.

ELECTRONIC ENGINEERS: One Electronic Engineer (telephone) and one Electronic Engineer (radio), starting salary $6,390. Requirements are: degree in electrical engineering and 2½ years professional experience, one year of which must have been in the specialized field, or 6½ years professional electronic engineering experience. Applications should be forwarded to: Hqs., 5001 SU Station Complement, 5th Army, 1660 E. Hyde Park Blvd., Chicago 15, Illinois.

THE SPECIAL DEVICES CENTER, an activity of the Office of Naval Research, located at Sands Point, Port Washington, Long Island, has several vacancies for electronic engineers at $6390 a year, and one vacancy for a general engineer at $6390 a year which requires specialized experience in audio-visual recording. Inquiries should be directed to the Industrial Relations Officer. Telephones: Flushing 7-8300 and Port Washington 7-3800.

RADIO OPERATOR TECHNICIANS. Veterans $3400-$4200 to start. Overseas opportunities. Amateur or commercial licenses helpful. Full pay during advance training. Good advancement opportunities. Submit resume with name, age, address, phone number—if any, military experience, private training, work experience, FCC licenses—if any. Armed Forces Communications and Electronics Association will forward same immediately to employer who will acknowledge your application direct.

TELETYPE OPERATORS AND CRYPTOGRAPHIC TECHNICIANS. Veterans $3200-$3700 to start. Overseas opportunities. Full pay during training period. Good advancement opportunities. Submit resume with name, age, address, phone number—if any, military experience, FCC licenses—if any. Armed Forces Communications and Electronics Association will forward same immediately to employer who will acknowledge your application direct.



You can still get your free copy of "The ABC's of TELETYPE Equipment"

Because of the many requests we received last spring for *The ABC's of Teletype Equipment,* we're offering it again. If you missed getting your copy, mail the coupon below.

The booklet covers the operation and uses of Page Printers, Perforators, Reperforators, and Transmitter Distributors . . . explains the Baudot code and how code pulses are dispatched over a signal line... touches on relaying systems and integrated data processing . . . and cites some of the imaginative ways users apply Teletype apparatus to solve a variety of communication and other problems.

Written in nontechnical language, *The ABC's of Teletype Equipment* is a useful primer on printing telegraphy. If you would like additional copies to pass along to members of your staff, just indicate the number you wish on the coupon. There is no charge, of course.

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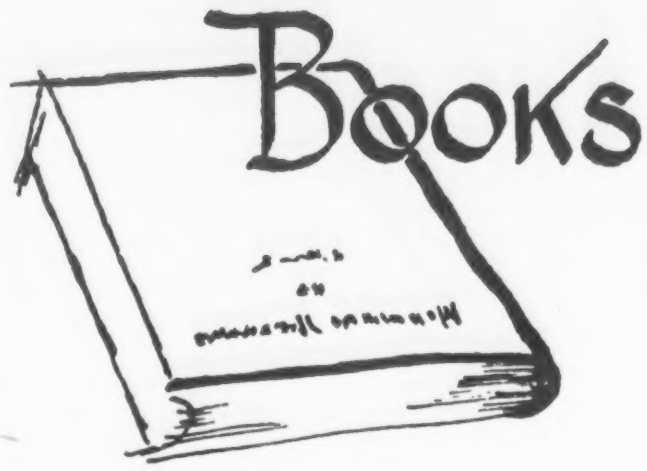

SPEAKING OF POLITICS, by Franklin Cary Salisbury, Vantage Press, New York, N. Y. 294 pages, $3.75.

In this age of social revolution, there is no substitute for a full comprehension of political words and ideas. It is absolutely essential that words used convey the meaning intended. The trick in talking politically is to know what you really mean.

Citizens of yesteryear spoke with the realization that the terms and words used would convey the proper thought to the listener. This political knowledge was acquired through family association or by conversation with friends and neighbors.

The acquisition of present-day knowledge relating to modern politics and the full comprehension of political jargon are difficult tasks. There was a time when the average citizen could acquire a meaningful knowledge of political terms and speak authoritatively with conviction and understanding.

To help overcome confusion for those engaged in speaking of politics, the author has provided a highly interesting text filled with mature thought.

Speaking of Politics is not of the easy-to-read, novel type. It has a philosophical trend which combines psychological reasoning in an academic atmosphere. Students studying the social sciences as well as laymen desiring a fuller appreciation for political verbage should find this particular publication of interest.

ELEMENTS OF RADIO, Third Edition, by Charles I. Hellman. D. Van Nostrand Co., Inc., Princeton, N. J. 354 pages, $4.95.

This volume provides a thorough grounding in all the basic principles of radio as well as a review of magnetism and electricity for the beginner in this field.

Added to this third edition of *Elements of Radio* is a chapter on transistors, while the chapters on television and modern electronic applications have been brought up to date and the Appendix has been revised and enlarged. Included also is a comprehensive discussion of FM, television, photocells, the electron microscope, and radar.

INDUCTION HEATING PRACTICE, by D. Warburton-Brown. Philosophical Library, New York, N. Y. 192 pages, $10.00.

This book is a detailed and current study of an induction heating process by a leading British expert, and deals particularly with its practical application to industrial problems.

Since practical application of the information given in this volume will be used with generators available commercially and having fixed power outputs, the examples used take this fact into consideration.

The design of work coils and inductors is discussed, and examples are given of handling mechanisms for heaters, as well as for methods of soldering and hardening of materials by induction heating.

APPLIED ELECTRICAL MEASUREMENTS, by Isaac F. Kinnard. John Wiley & Sons, Inc., New York, N. Y. 600 pages, $15.00.

This volume is one of a series written by General Electric Co. authors for the advancement of engineering practice and is divided into two parts.

The book includes chapters on the historical background, theory, and analysis of measurement, and a review of the state of the application art in selected fields of measurement. Part One of the volume covers the measurements of electrical quantities, and Part Two covers the measurement of nonelectrical quantities.

Information is also given regarding a method for analyzing and synthesizing measurement devices and systems.

INTERNATIONAL DICTIONARY OF PHYSICS AND ELECTRONICS. Published by D. Van Nostrand Co., Inc., Princeton, N. J. 1004 pages, $20.00.

Contained in this one volume are all the principal terms used in classical and modern physics, including laws, relationships, equations, basic principles and concepts. Also featured are the most widely used instruments, apparatus, and their components.

The editors, an international group of scientists and educators, have defined terms from sixteen major subject divisions and have included over 300 illustrations in the text. For those readers who do not have an extensive, mathematical background, both explicit and discursive statements and entries are given, as well as definitions of the more common mathematical terms encountered in present-day physics.

As an additional aid, a comprehensive plan of cross-referencing has been used, with all subsequent references given in bold-face type.

BASIC ELECTRICITY, Laboratory Manual for Radio and Television Technicians. 84 pages, $1.75.
BASIC ELECTRONICS. 91 pages, $1.75.
BASIC RADIO AND RADIO-RECEIVER SERVICING. 105 pages, $2.00.
By Paul B. Zbar and Sid Schildkraut, RETMA Teaching Staff. McGraw-Hill Book Co., Inc., New York, N. Y.

These three volumes are a series of laboratory manuals which, with an Instructors' Guide, comprise a preemployment course for beginners in the fields of radio, electronics, and electricity.

Written under the guidance of the Educational Advisory Committee of the Radio-Electronics-Television Manufacturers Association for trade, vocational, and technical schools, the text sets forth the materials and objectives for each lesson in simple, easy-to-understand language. Included in the introductory information is a comprehensive discussion of the theory and practice related to a specific job, as well as basic principles and techniques in the use of specific instruments. The effects of variation of circuit parameters on circuit operation and performance are emphasized.

Questions are given for the student at the end of each lesson.

VACUUM-TUBE CIRCUITS AND TRANSISTORS, by Lawrence B. Arguimbau. John Wiley & Sons, Inc., New York, N. Y. 646 pages, $10.25.

This new and up-to-date extension of Mr. Arguimbau's *Vacuum-Tube Circuits* includes material on transistors, frequency modulation, in-

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verse feedback, and noise. Fundamental principles are emphasized throughout the text.

Both beginners and the more experienced in industry will find the book useful. Formal mathematics is avoided, with each chapter progressing from relatively simple material to more advanced points of view.

The most common transistors and the fundamental circuits they employ are presented, with the physical meaning of transistor parameters stressed.

HOW TO MAKE GOOD TAPE RECORDINGS, by C. J. LeBel. Audio Devices, Inc., New York, N. Y. 159 pages, $2.50. ($1.50, paper bound.)

Written in simple, non-technical language, this complete handbook of tape recording will be of value to even the most inexperienced home recorder, as well as to the experienced technician.

Completely new in its coverage, this volume includes a glossary of tape recording terms, and a section for notes by the reader.

The author is the vice president of Audio Devices, Inc., as well as secretary of the Audio Engineering Society, and columnist for the Audio Record. Contributing editors. also well known in the recording field. are responsible for chapters on microphone recording, tape editing. and the use of sound effects.

INTRODUCTION TO PRINTED CIRCUITS, by Robert L. Swiggett. John F. Rider Publisher, Inc., New York, N. Y. 112 pages, $2.70.

Replacing the old point-to-point method of circuit wiring by automation has been keyed to the use of the printed circuit. This volume describes the type, characteristics, functions, and construction of the various printed circuits encountered in electronic equipment, and their effects on the techniques for servicing devices that contain them.

Providing a system of making electrical interconnections without wires, printed circuits give a supporting medium for components in a form that is readily adaptable to machine handling and assembly. Heretofore, no machine, no matter how complex, could adapt point-to-point wiring to automatic production methods.

The book will be of particular interest to technicians who desire an explanation of the maintenance techniques peculiar to printed circuits. Also, design engineers will find it a comprehensive introduction to this field.

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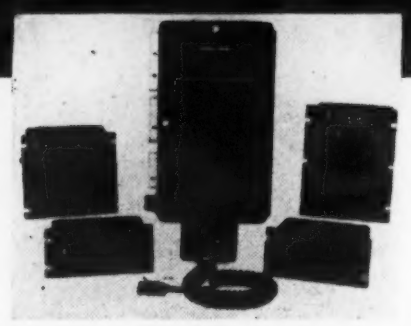

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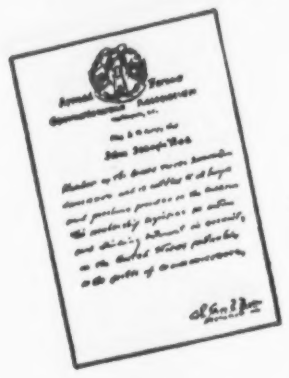

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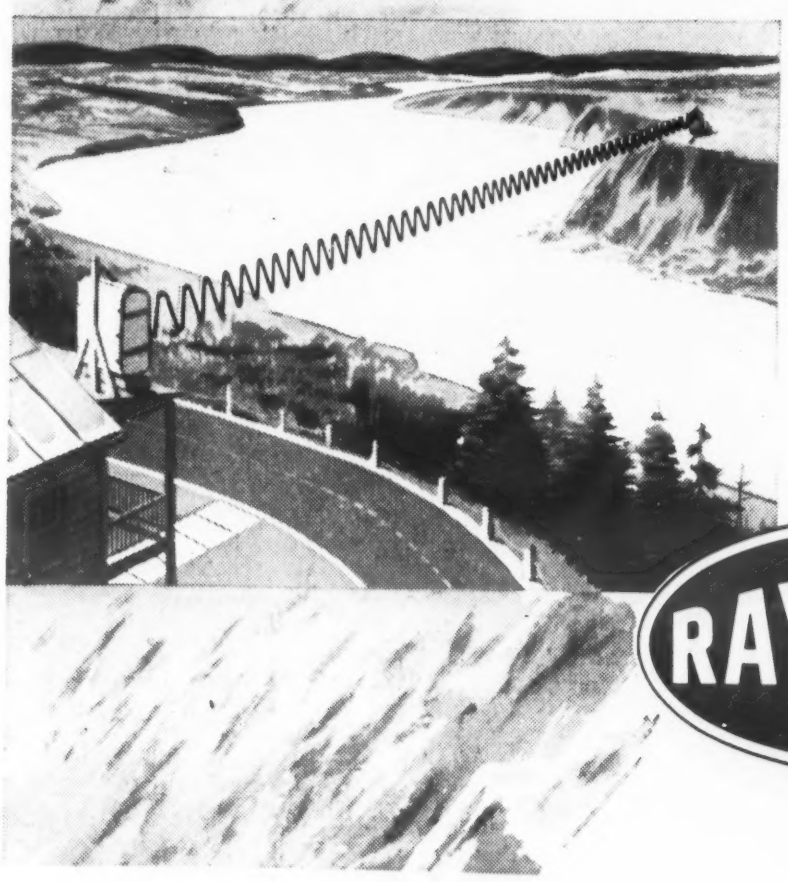

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